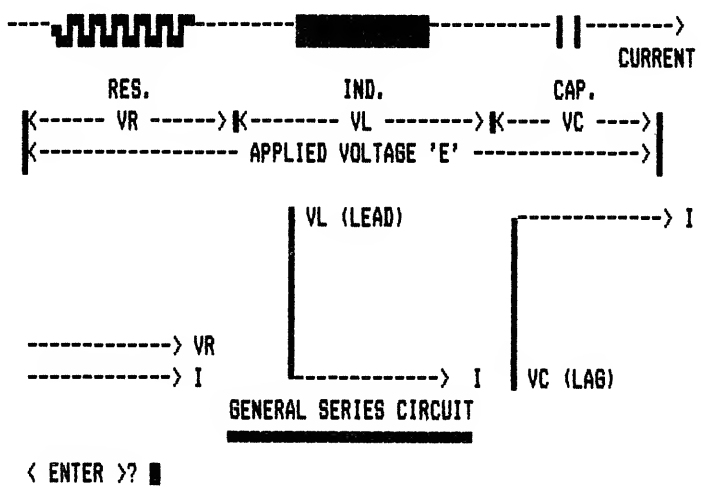
• TRS-80 • SYSTEM 80 • VIDEO GENIE
• PMC-80 • HITACHI PEACH
• TRS-80 COLOUR COMPUTER

4/2/83

Vol. 3, Issue 8, July 1982

Non-standard Tandy edge connector p.9



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***** ABOUT MICRO-80 *****

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***** EDITORIAL *****

On behalf of all the staff here at MICRO-80, may I wish you all the best in the coming year. I feel a little nervous embarking on this, my maiden editorial, and a little worried that some of you may not think me too bright considering that my decision to accept this position at this point in time was voluntary. But, I assure you that the discrepancy between the calendar and cover month has reached a maximum and that one of my main objectives is to remove this discrepancy altogether. This will, naturally enough, take some time to accomplish and I hope that you will afford me the same degree of patience you have my predecessor, (if not more, since by comparison I am but a novice!).

Perhaps I should begin by telling you a little about myself and how I acquired my interest in computing. A long time ago, or so it seems now, when I was still in high school, I became very interested in electronics and spent the next few years trying to make the perfect hi-fi amplifier. Most of my attempts (usually designs from various electronic magazines) died horrible deaths at the moment of powering them up and I eventually bought one. Nevertheless, this fascination with electronics sustained me until I came across logic circuits in third year Physics at University. At the same time I had my first taste of computing in Applied Maths but never had the faintest suspicions that the two were closely connected (computers and logic circuits). My greatest achievement was the perfection of a program, written in FORTRAN, to produce a calendar. Elsewhere in this issue, my latest attempt appears - yet another milestone, as it is the first of my programs to ever be published! I seem to recall expending a great deal more effort the first time.

As Ian mentioned last month, I was, until recently, a high school teacher, in the areas of mathematics and science. When the Education Department took an interest in computers and purchased Apple microcomputers available for use in schools, my interest in computing was rekindled. The technological revolution in the electronics industry was well under way and the price of the personal computer had fallen to the point where it was within my reach (Yes, I had thought of making the perfect computer but my past experiences quashed that idea pretty quickly). It was some time before I became proficient in BASIC and still more time before I could cope with assembly language, but shortly thereafter, I decided to buy a computer. For financial reasons, I bought a System 80 with Level II BASIC and 16K of memory, despite the fact that the Z80 was a different processor. Transferring from the 6502 to the Z80 proved to be less difficult than I had imagined and it was not long before I had achieved the same level of proficiency with the System 80.

Why did I buy a computer? Well, to be perfectly honest, for the thrill of the arcade games - I figured that at 20¢ a time, it would eventually pay for itself! But after a while the novelty wore off and I became more interested in the computer itself, in how it worked and how it did what it did. I soon found that 16k of memory was not enough and began to hate my cassette, so I bought an expansion interface and a couple of disk drives from Dick Smith's. Needless to say, as these had only just been released, my system had teething troubles for a long time. When you add to that my disappointment in the DOS (OS-80) and the general lack of support software, I began to seriously doubt the wisdom of making such a large investment in expanding my original system. Then I had what I consider 'a lucky break' - I came across MICRO-80, right here, in my own state, no less!

I suppose there is no need to tell you the rest of the story but I found friendly help, assistance and much of the support that I was looking for elsewhere. I began to subscribe to the magazine and to learn much more about my computer, and in less time, than I would have done alone. My thirst for knowledge and understanding drove me further to the point where I undertook studies in Computing Science. At the same time, my association with Ian and this organisation grew to the stage where I am now in the position where I can offer to be of help to you through the pages of this magazine.

Lest he feel slighted in any way, I think it essential to acknowledge the tremendous effort that Ian has made. He has conceived the idea and worked hard to make it a success. The combination of his efforts and yours, the subscribers who provide most of the material and valuable input, have made this enterprise so successful that he has been very hard pressed to find the necessary time to devote to the magazine. Many thanks to you, Ian, for the work you have done - I shall endeavour to meet this challenge.

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***** PEEKing (UK) - by Tony Edwards *****

This month I am going to talk about INPUT/OUTPUT again as there are a number of developments in this field in this country at this time. We are still promised the Mini-Disk, and the Micro-Disk but except for a few prototype units which are doing the rounds I have not seen any sign of a commercially available item. However the cost of the standard Disc drives is falling all the time, so perhaps the manufacturers are expecting the cheaper smaller units soon. Even before these units have arrived the next step is arriving - a 'hard disk', or rather a programmable memory unit which is cheap enough to allow it to be used to store programmes for practically instant recall. This is now becoming available in two forms, preprogrammed and self-programmable. The potential size of the storage available is very great indeed and as the first cost of memory devices continues to fall this sort of storage becomes attractive. I hope to test one of these devices in the next month or two and will of course report to you on the results.

Still on the subject of input/output many of our older readers will remember my reports of the 1200 baud conversion program supplied by the UK software house Kansas. It worked very well on the TRS-80, but was never successful on the GENIE/SYSTEM 80. Kansas have now produced a different program which does work on the GENIE, at least it works on mine. It is simple to use and produces tapes of both machine language and BASIC programmes which load at double speed. A good buy to load those long programmes.

- 0000000000 -

***** INPUT/OUTPUT *****

From: Mr. C. Stobert - Wellington, N.Z.

My hobby level of computer activity has been satisfied with BASIC, though perhaps a couple of games may be better if they moved a little faster. Three BASIC programmes in "TRS80-Programs" (Cat No. 62-2064) from Tandy produce hypnotic graphics displays using strings PRINTed. Consequently, I have been curious of the display of "Graphix" since it was published in Issue 7 of Micro-80, but not sufficiently so to delve into assemblers etc. I recently compromised with the attached solution. It may not get top marks for originality, but may be of interest to other readers in a similar situation. 16K Memory is reserved from 28671. I retained operation from 7000H.

BASIC loading of memory does not take too long, but line 140 lets you see something is happening. count to 784.

Data lines were entered using two people, one reading, one typing, then checking back before entering. There are 49 lines of data entering 16 bytes per line, but it did not prove too tedious, and the result was worth the effort. We took two dumps before running, and surprise! surprise! It worked first time.

```
10 CLS:POKE16553,255
20 DEFINTL,R,D,P,N:DEFSTRA,B,S
30 PRINT@202,"GRAPHIX - MICRO-80 - JULY 1980"
40 PRINT@452,"PLEASE BE PATIENT WHILE I"
50 PRINT@520,"GET MY DATA INTO PLACE ...."
60 P=28672:N=1
70 READS:IFS="END"GOTO160
80 A=LEFT$(S,1):B=RIGHT$(S,1)
90 L=ASC(A):R=ASC(B)
100 IFL>57THENL=L-7
110 IFR>57THENR=R-7
120 L=L-48:R=R-48
130 D=16*L+R:POKEP,D
140 PRINT@896,"POKE NO. ";N
150 P=P+1:N=N+1:GOTO70
160 POKE16526,0:POKE16527,112:CLS:X=USR(0)
170 DATAF3,21,0F,72,CD,4D,71,CD,A3,71,21,4D,72,CD,4D,71
180 '(CONTINUE DATA LINES -- NOTE NO SPACE AFTER "DATA" OR BETWEEN
640 '                        COMMAS AND DATA BYTES)
650 DATA41,40,40,40,40,40,40,40,40,40,40,40,40,40,40,40
660 DATAEND
```

(Thank you for this contribution, Mr. Stobert. The technique you use for POKEing machine language programs into memory is an interesting one and is certainly superior to the more common method of converting the machine code to Decimal manually and then entering it into the DATA statements. By converting HEXadecimal code in your BASIC Program, you save a considerable amount of work and, if the data statements are laid out in lines of 16 bytes per line, it is easy to check against a Hex dump. It is only recently that we have seen this technique used and you are to be congratulated in being amongst the first to develop it - Ed.)

From: R. Edwards - Ivanhoe, Vic.
To: M. Bauk - Kalamunda, W.A.

In response to your letter in June '82 MICRO-80, where you requested help to the "Other Venture" entitled "Excape from Tramm".

The first location is quite tricky and took me some hours to get past, so you're not entirely alone (I also believed it to be faulty). Nothing can be done on the ship - so enjoy the crash landing. Upon landing the command LOOK SHIP will reveal a "nylon rope" which requires GET NYLON ROPE to pick it up. Moving south with S you will come to a cliff. The command LOOK CLIFF will detect a bush growing on the cliff, although this last command is not necessary. Then type ROPE BUSH (another tricky part) and CLIMB ROPE to reach the top of the cliff.

From here you are on your own, hope you have fun figuring out the rest of the "Venture".

(I think Mr. Bauk will be eternally grateful for your assistance, Mr. Edwards - Ed.)

From: J. Wragg - Page, A.C.T.

Recently I had a small mishap with several tapes - all of the data just disappeared. The tapes were stored in a desk drawer in cassette boxes, but not all of the tapes were affected (i.e. some tapes remained intact while others were completely wiped). Can you offer any clues as to what may have caused this to happen?

(Recorded information on cassette tapes, or any magnetic media for that matter, will be damaged or erased by exposure to strong magnetic fields, which could have occurred by operating a television set or some appliance with an electric motor or transformer on the desk near the tapes. These types of appliances can generate strong magnetic fields. Eddy suggests that some of the cassettes may have been shielded from damage by the others, but the incident does seem mysterious. It would be wise to be careful in this respect in the future and store recorded magnetic media away from sources of heat and magnetic fields. - Ed).

From: J. Finlayson - Bluewater, Qld.

In your journal I notice fairly frequent references to difficulties with tape loading with the System 80. I have one of the early models and I have found no difficulties with loading either BASIC or System tapes provided that I clean and demagnetise the tapehead frequently. A number of my acquaintances with later models have also found this a certain cure for any difficulties but I cannot say the same thing for TRS-80 owners. A problem I have found with saving on computer grade tapes has been failure after re-using several times, this has apparently been due to incomplete erasure by the builtin deck and is easily overcome by erasing on a high quality tape deck if one is available.

(I must agree with Mr. Finlayson's comments, as I have found the same is true on my early model System 80. Although I've never demagnetised the heads, I understand that a strongly magnetised head can erase a tape while playing it! The motto - for reliable cassette operation, the mechanism needs to be clean and use good quality tapes - Ed.)

From: Mr. G. Bull - Balhannah, S.A.

Recently I bought an expansion interface and disk drives for my System 80. A copy of DOSPLUS was included with the purchase of the first drive from MICRO-80, but I have had problems copying my BASIC programs from cassette to disk. They CLOAD in Level 2 without any errors, but I can't get them to CLOAD correctly from DISK BASIC.

(DOSPLUS, NEWDOS and other DOS's more sophisticated than TRSDOS make the assumption that the user is already familiar with the Tandy version of DOS and DISK BASIC and therefore neglect to mention or emphasize the need to disable the interrupts during cassette I/O. All DOS's use the 25mS interrupt to update the software real-time clock and perform other background tasks and, as the ROM routines that read and write data to cassette have critical timing loops, it is essential that interrupts be disabled during cassette I/O. If they are not disabled, information coming in during reading will be lost and CSAVEd information will be overwritten with the interrupt pulses. To disable interrupts under DISK BASIC, type:

```
CMD "T"  (for TAPE?)
```

and to enable them, type:

```
CMD "R"  (for RESTART?)
```

This must be done for both reading and writing to cassette while in DISK BASIC. Note that returning to DOS or re-booting the system enables the interrupts, irrespective of whether or not CMD "R" has been entered. - Ed.)

From: Mr.L. Montero - Bellambi, N.S.W.

I have bought a System 80 Blue Label and have been using it for quite a while with no problems.

I CLOADed the program "SOUND EFFECTS REVISITED", published in Issue 22, September, 1981, page 29. My problem is that the program turns on the internal cassette port instead of the internal speaker. Everything else seems to be working perfectly. I believe the problem is in the data in line 190 but I do not know what to do. Can you please help me?

(You are correct in suspecting the data in line 190. A number of people have contacted us concerning this problem - using the internal speaker on the Blue Label. One user, after much experimenting, informed us that the way to cure the problem is not to set bit 2 of port 255 (ØFFH) high. Inquiries to Dick Smith's yielded the same information with an explanation.

In order to make the System 80 more compatible with the Tandy, so that it could use existing Tandy software that has sound without any patches, the Blue Label requires that bit 2 of port 255 be set low to enable the internal speaker. What this means is that there now exists an incompatibility between the Blue Label and earlier System 80's in this respect.

Line 190, as originally published is shown as:

```
190 DATA205,127,10,229,221,225,221,78,0,121,183,200,221,70,1,62,
5,211,255,16,254,221,70,1,62,6,211,255,16,254,13,32,235,221,35,2
2,1,35,1,255,255,33,48,0,9,56,253,24,214
```

To enable sound on the Blue Label change it to:

```
190 DATA205,127,10,229,221,225,221,78,0,121,183,200,221,70,1,62,
1,211,255,16,254,221,70,1,62,2,211,255,16,254,13,32,235,221,35,2
2,1,35,1,255,255,33,48,0,9,56,253,24,214
```

Note that the only changes occur in the second line where a 5 becomes a 1 and a 6 becomes a 2. This will set bit 2 low and should fix the problem according to the above advice.

Unfortunately, Mr. Montero, your letter omitted to include your full address and I am unable to reply in writing. I hope this reply will suffice. - Ed.)

From: Mr. S. Goodhead - London, England.

I have just spent a major portion of my Christmas Holiday trying to type in a program from MICRO-80 No 6 Vol 3 (May 82) SKYDIVER.

I was not surprised when after hours of typing and editing out errors it did not work. It is a normal occurrence for me; however this time it destroyed itself - "UL ERROR 810". An attempt to LIST gave what I think you call garbage. LIST 10 = 10:+- Line 20 gives TT=26810 TA = 26869 & M = 26820.

It seems any attempt to poke a value into this area creates havoc.

I have tried under LDOS, NEWDOS, and also under BASIC 2 (without disk) Poking the USR (0) Address it still corrupted the short program - the values were now 17129, 17188, 17139.

I am wondering if there is something wrong with my computer, I would appreciate your observations. I also suspect that data statements may contain errors. Has any other reader had trouble or am I the only one? I have TRS-80 Mod 1 Lev II. Lowe electronic interface to Genie +32K expansion unit, 2 disk EPSON MX 80. It is unstable - disk unit starts up for no reason and everything locks up - I think cable connections are unreliable.

(Your last statement suggests very strongly that there is indeed something very wrong with your computer. The undefined Line error tends to make me suspect that the memory, or some parts of it, are defective. When a situation such as this arises it is virtually impossible to debug any programs in the machine - I once had a similar problem with a defective 16K block of memory in my machine. Very short, simple machine language programs would work for a moment and then fill the screen with junk, turn on the disk drives and I would have to reset the machine. It was only by accident that I suspected a hardware fault, when after altering memory contents from a monitor, I found that they had changed after examining them a few moments later, without ever running the program!

Although line 10 lists as garbage, this is, in fact, correct, but the garbage should start just after the REM, not where you have indicated. The reason for this is that the first part of the program finds where in memory the BASIC program starts and positions to the memory location immediately after the REM token. The machine language routine is then POKEd into the memory taken up by the title and explains why the warning regarding this line was necessary in the text accompanying the program. If you refer to the reply to Mr. Montero's letter you will notice that the DATA lines are the same, and there are no errors here.

What I would suggest is that you load the program into memory but do not run it. Examine line 810 after a short time (say, 10-20 seconds) and if the line lists differently then you most probably are having trouble with the memory itself. -Ed).

- 0000000000 -

***** MICRO-BUGS *****

Inevitably, no matter how careful one tries to be, there will be errors, mistakes and omissions in articles and programs. Here's where we make corrections.

***** Addendum to Mr. Coleman's SAVING AND LOADING M/L PROGRAMS ON ESF WAFER *****

One very important point that was missing from my original article on SAVING AND LOADING M/L PROGRAMS ON ESF WAFER was how to save the utilities SAVER and LOADER onto wafer themselves! Hopefully these few paragraphs will clarify everything.

First, you will need to enter the machine language utilities into memory. There are a number of methods of doing this - most of them have been explained in this magazine before. Probably the quickest and easist method would be to use any monitor (such as BMON or the ESF monitor) to load the bytes directly into memory. Neither utility is lengthy so this shouldn't take too long. Start off with SAVER and load the bytes shown in the second column of the listing into the locations shown in the first column. Do the same thing with LOADER, then exit the monitor and return to BASIC.

Now get out the wafer that you want these two utilities to reside on and put it into the drive. It doesn't matter which one you save first, so now save them using these parameters:

@SAVEX,16450,31,693 and
@SAVEX,16500,12,693

The reason for having an auto-start address of 693 is that this is the entry-point for the SYSTEM command.

Here is a list of some parameters that I have discovered so far (why don't you write in with some others):

PROGRAM	START	LENGTH	ENTRY
Adventure #3	17152	15616	17232
Air Traffic Controller	17152	2618	17152
Asylum *	17139	15620	17326
Back-40 (Advent. Inter.)	17408	6145	17408
BMON	29248	3263	31641
Disassembler (Instant Soft.)	28672	3012	28672
Edtasm-Plus (Microsoft)	17280	12035	17280
Eliza (Tandy)	20480	10241	20480
Penetrator	17408	15360	17408
Penetrator Editor	17408	15360	17409
S.Key	17216	1298	17216
Invaders (Tandy)	17174	3245	17717
Starfighter	17116	15652	17116
Starfighter Trainer	17116	15652	17116
Zbug stand alone	17280	6070	17280

* Note that these are the correct parameters for ASYLUM: last month's were incorrect.

LOTTO PREDICTOR - Issue 10, Sept. '80 (pp. 29-32).

This program has two errors and some potential dangers that need clarification.

(a) The copy of this program as supplied on cassette has several control characters between the OPEN statement and the comment in line 690 that list as spaces. These produce a SYNTAX ERROR during the execution of line 690 and the ON ERROR trap sends the program to line 790,

resulting in an endless loop. Re-type line 690 as it appears in the magazine listing to remove these characters.

```
690 OPEN "O", 1, "LOTTO/TXT": 'FOR CASSETTE USE CHANGE TO 690 INPUT "READY CASSETTE"; D$
```

(b) The program should be terminated in line 780 and not allowed to proceed to line 790. Change line 780 to:

```
780 PRINT "RUN ENDED": CLOSE:END
```

With these changes the program will function as described in the accompanying text. However, during the investigation of this program, a number of interesting observations were made about the ON ERROR GOTO/RESUME statements.

(1) The ERROR GOTO statement establishes an error trap and any subsequent errors that occur during program execution (or after!) will be processed by the program line referenced. The fact that an error at BASIC "READY" prompt causes resumed execution of the program in the error handler can be disatrous!

(2) An error trap can be reset using the statement ON ERROR GOTO Ø.

***** WARNING - JOYSTICKS AND INPUT/OUTPUT PORTS FOR YOUR '80 *****

There is no actual bug in this hardware project but there is a potential source of trouble for the unwary. Mr. Tilley, from Victoria, had assembled the interface and connected it to his Model I only to find the system locked at power up. He made every effort to try and determine the cause himself, but to no avail, so he contacted us for help. I couldn't image what the trouble could be either and, in turn, contacted Allan Dent, the author. He informed me that the Tandy edge connector on the Model I has non-standard numbering in that the odd-numbered pins are on the top and not the bottom. Although there should be no problems if you follow the instructions in the article, Mr. Tilley soldered the other end of the rainbow cable to an IC plug. In this case, you must be very careful indeed, because the leftmost strand of the cable will be connected to pin 2 on the edge and not pin 1! Mr.Tilley found that after rectifying this, (and the rest of the wiring on the IC plug) the interface functioned as intended.

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***** SOFTWARE REVIEW - TANDY'S VERSAFILE - by J. Dowdall *****

In my occupation as a software consultant, I have occasion to evaluate many 'off-the-shelf' programs and packages for clients. Once in a while, I find one which becomes a useful tool in my business VERSAFILE is one of these.

My client's requirement was for an easy-to-use Data Base which would enable him to store and retrieve brief details on formulae used in his Plastics manufacturing. Formulae were to be stored by product category, and data entry and retrieval had to be simple enough that relatively untrained operators could learn to handle it in a few minutes.

As it turned out, even I can be lucky! The first program I looked at was Versafile. At first it seemed too simple, and I went on to look at some more. After two or three others, though, I was back to look again.

The Command language is straight English - Versafile figures out what you mean. Data entry and retrieval are done the same way - by forming statements or questions. Close your statements with a period, and the statement is stored in a 'keyword file'. Close with a '?', and the program searches the appropriate keyword file for entries which match, and displays or prints them. The program has a total of only seven 'commands', all of which are one or two letters or symbols which fit neatly into an 'almost English' syntax.

Records can be of random lengths from one to 240 bytes and no prior formatting is needed - although the output is in the form of lines (no formatted screen). This could be a disadvantage, especially if your records are near maximum length, as words get chopped off as the line wraps around the screen. Another disadvantage is that the records aren't numbered on the display or in print-outs. Considering the price of this program, however, these are minor annoyances.

The manual is supplied in a gold-leaf on brown vinyl ring-binder, with the disk in a plastic pocket at the front. Eighteen pages (about one third of them blank) with sample runs and pictures of the video are sufficient to get you up and away in less than twenty minutes.

Versafile is written in BASIC, and the manual gives a few hints on changes you can make to tailor the program to your own needs. One change not mentioned is altering the number of keyword files to be used. As supplied, eight keyword files are used. My client needed twenty, and the changes turned out to be quite simple.

To increase the number of keywords, only six lines need be EDITed. these are:

```
Line  1000  change the 8 to 20
Line  1200  change the 45 to 57
Line  1670  change the 8 to 20
Line  2000  change the 8 to 20
Line  6025  change the 8 to 20
Line 10000  add an extra 12 keywords (DATA items)
```

and that's the lot! With more keyword files, Versafile's searches are faster (except global) and you can store items under relevant headings. There is only one other change I would recommend: after you have entered two or three hundred lines, print out the entire set of files with P *? and count the number of entries under each keyword. Then EDIT line 10000 again and change the order of the keywords in it to reflect the frequency of use. This gives you another boost of speed - not much, but enough to notice on long searches.

Since obtaining Versafile, I've finally found a way to store magazine article references, and retrieve them in a few minutes without having to leaf through the whole collection for the reviews I need. And a way to list all of my clients along with phone numbers, computer systems, programs used, and possible future requirements.

My rating for Versafile is: EXCELLENT ***

- 0000000000 -

***** THE THEORY AND TECHNIQUES OF SORTING - PART 6 - by B. Simson *****

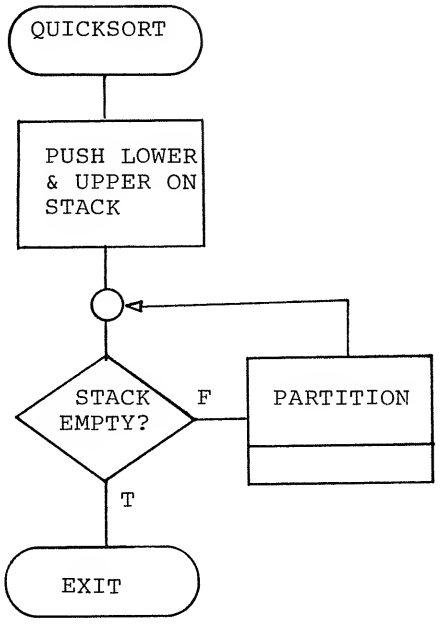
In the first article of this series, a simple method of sorting using exchange techniques was shown, which is the "Bubble Sort". Although it is one of the simplest algorithms around for handling more than 2 or 3 values, it is not one of the most efficient, far from it. This is easily verified by performing a test on a fixed list of numbers and comparing the time taken to execute with some of the other algorithms shown in later articles. However, don't write off techniques of sorting by exchange as being too inefficient yet, without examining at least one other exchange technique.

PARTITION-EXCHANGE SORT (QUICKSORT)

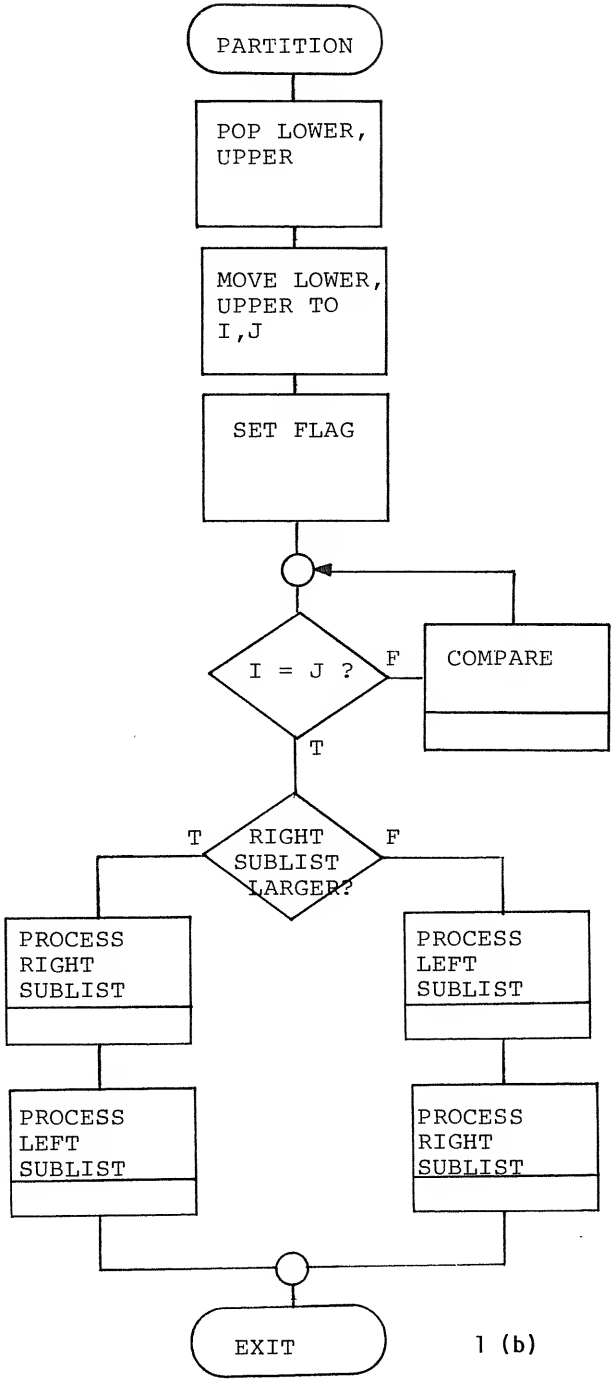
This sorting algorithm is a much more efficient method of exchange sorting than "Bubble", as its alias imples, "Quick"! Its use of specialized data structures is not as extensive as the list insertion sort or the tree sort. It just uses a stack as an auxiliary structure to the main array holding the data. The algorithm is defined in figure 1. It involves placing a particular item in its final position in the list. In so doing all items which precede this item are equal to or smaller in value, and all items that follow it are equal to or greater than this item in value. This process splits or partitions a list into two sublists, with the item between the sublists placed in the correct and final position in the list, hence the name "Partition -Exchange" - a process of partitioning a list and exchanging items. The key to understanding this algorithm is that the same process as was applied to the list before it was partitioned is applied to each sublist, and that's all. This will eventually place all items in the correct position in the list as more sublists are created by partitioning sublists, with a correctly positioned item between the sublists. This algorithm can also be implemented recursively, as can be seen by its definition, but the approach in figure 1 is by iterative means. The stack, provided implicitly by recursion, is used in the iterative approach to store the bounds (positions of first and last item) of the sublists as they are created.

THE ALGORITHM IN DETAIL

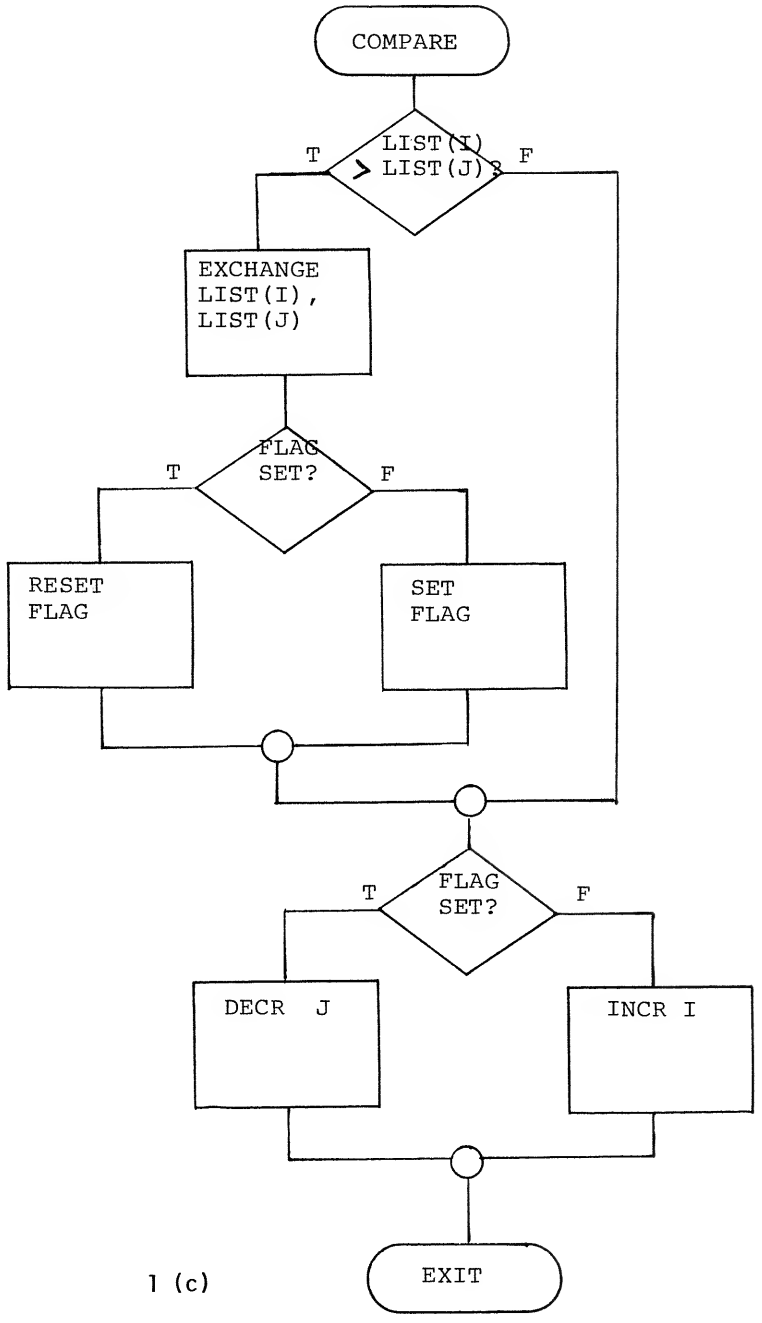
The process starts by pushing the lower and upper bounds of the current sublist on the stack. Then, as the flowchart shows, this list is partitioned until the stack is empty. The partition module first gets the bounds of the sublist to be partitioned from the stack. On the first time that this module is executed, the sublist bounds popped from the stack are the bounds of the entire list, as pushed in the initialization phase, but as far as the partition module is concerned, it is just another sublist to be partitioned. The sublist bounds are used to initialize two indices into the list. Items are then compared using these two indices, which will initially point to the first and last item in the sublist. During the comparison phase, the indices are brought closer together by either incrementing the lower index, or decrementing the higher index, depending on which one was changed last. The decision on whether to increment the lower or decrement the upper depends on the status of a toggle flag. If it is off, the lower index is incremented, otherwise the upper index is decremented. The toggle flag is only toggled when an item exchange is necessary, that is, when item pointed to by lower index is greater than item pointed to by upper index. The comparison phase is complete when the lower and upper indices point to the same item, being the item placed in the correct position in the final list. It also now separates two sublists. The larger sublist bounds are stacked, and the process repeated on the smaller sublist. Stacking the larger sublist ensures minimum stack growth. The partition module in the flowchart shows that the larger sublist is processed first, then the smaller, but since the smaller sublist bounds are stacked last, they are also popped first for processing in the partition phase when it is repeated.



1 (a)



1 (b)

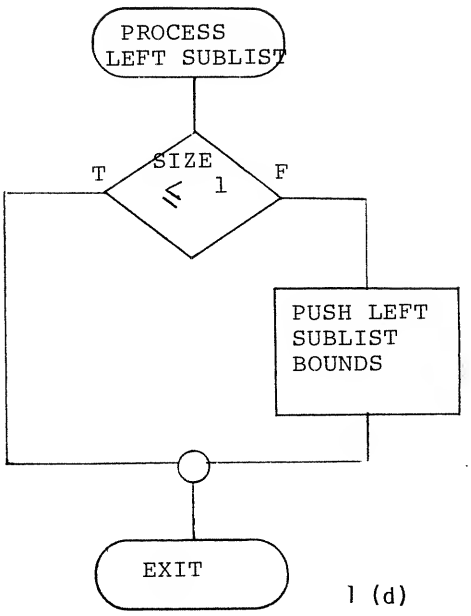


1 (c)

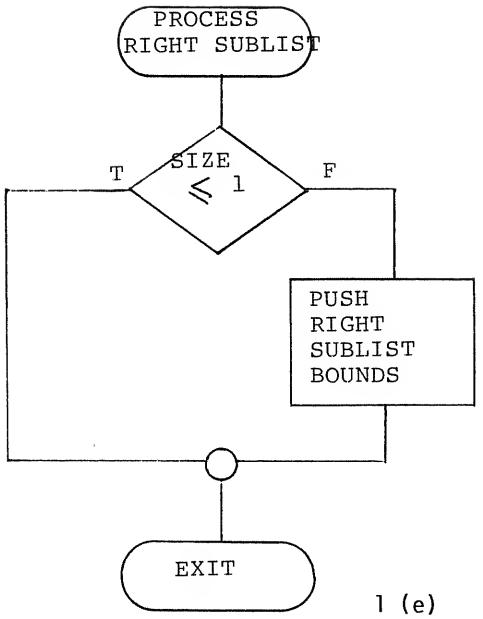
Figure 1. Partition-exchange sort algorithm (Quicksort)

LOWER, UPPER are bounds of the list being sorted.

(a) Main Routine
(b) Partition Routine
(c) Compare Routine
(d) Process Left Routine
(e) Process Right Routine



1 (d)



1 (e)

ILLUSTRATING

Consider the following list: 39 24 68 45 37 57. One pass in the partition phase will be examined. An asterisk before an item indicates the current item being compared using the two indices.

						TOGGLE FLAG
*39	24	68	45	37	*57	ON
*37	24	68	45	*39	57	OFF (1 & 5 SWAPPED)
37	*24	68	45	*39	57	OFF
37	24	*39	45	*68	57	ON (3 & 5 SWAPPED)
37	24	*39	*45	68	57	ON
37	24	**39	45	68	57	ON

Both indices point to the third item on pass completion. This item has been placed in the correct final position in the list, and separates two sublists. The process has also guaranteed that all items in the left sublist have equal or smaller values, and all items in the right sublist have equal or greater values. Sublist 37, 24 is then processed in the same manner, while sublist 45, 68, 57 is stored. It will eventually be processed when its bounds are popped from the stack at the start of a partition phase. When a sublist of only one item is reached, its bounds are no longer stacked, and it is considered fully processed. A variation to this algorithm involves using this method to create sublists of some critical minimum size. When that size is reached, another sorting algorithm is employed to sort the sublist by passing its bounds to the auxiliary sort. This reduces the stack size in quicksort, and fewer sublists are created, but I have found that this variation is still slower, because of the less efficient sorting algorithm used to sort a particular sublist (Bubble, Selection or Insertion). The method shown here processes sublists down to their absolute minimum size (one).

DEMONSTRATION IN BASIC

Following is a BASIC program demonstrating the algorithm. You will find a great improvement in execution time when compared to Bubble, Selection or Insertion sort, particularly when the list size is large (for BASIC, say over 20). Variables used are:

I,J	INDICES INTO LIST
L,U	LOWER, UPPER SUBLIST BOUNDS
S	STACK
SP	STACK POINTER
FL	TOGGLE FLAG
L ()	LIST OF ITEMS BEING SORTED
SL,SR	SIZE OF LEFT/RIGHT SUBLIST

```
5000 '      PARTITION-EXCHANGE SORT (QUICKSORT)
5010 '               BY B. SIMSON.
5030 DEFINTA-Z:I=0:J=0:SP=0:T=0:FL=0
5040 CLS:PRINT@13,"PARTITION-EXCHANGE SORT (QUICKSORT)."
5050 INPUT"SIZE OF LIST TO BE SORTED";EL
```

```
5080 X=EL/4:IFX<10X=EL
5090 DIML(EL),S(X)
5100 FORM=1TOEL
5110 L(M)=RND(1000)-500
5120 NEXT
5140 GOSUB5210
5150 PRINT:INPUT"HIT ENTER TO START THE SORT";X
5160 PRINT" SORTING...":GOSUB5260
5170 PRINT"LIST AFTER SORT: "
5180 GOSUB5210
5190 END
5200 ' PRINT L LIST
5210 FORM=1TOEL
5220 PRINTL(M);
5230 NEXT
5240 RETURN
5250 ' QUICK-SORT ROUTINE.
5260 L=1:U=EL
5270 SP=SP+1:S(SP)=L:SP=SP+1:S(SP)=U
5280 IFSP=0THEN5300
5290 GOSUB5320:GOTO5280
5300 RETURN
5310 ' PARTITION LIST
5320 U=S(SP):SP=SP-1:L=S(SP):SP=SP-1
5330 I=L:J=U:FL=1
5340 IFI=JTHEN5400
5350 IFL(I)<=L(J)THEN5380
5360 T=L(I):L(I)=L(J):L(J)=T
5370 IFFL=1FL=0 ELSEFL=1
5380 IFFL=1J=J-1 ELSEI=I+1
5390 GOTO5340
5400 SR=U-I:SL=I-L
5410 IFSR>SLGOSUB5440:GOSUB5480 ELSEGOSUB5480:GOSUB5440
5420 RETURN
5430 ' PROCESS RIGHT SUBLIST
5440 IFSR<=1THEN5460
5450 SP=SP+1:S(SP)=I+1:SP=SP+1:S(SP)=U
5460 RETURN
5470 ' PROCESS LEFT SUBLIST
5480 IFSL<=1THEN5500
5490 SP=SP+1:S(SP)=L:SP=SP+1:S(SP)=I-1
5500 RETURN
```

The processing overheads of Microsoft BASIC running on a 1.7 or 4 MHz machine does not do justice to this algorithm. For my own interest, I developed an assembly language version to see just how fast it would be in machine language, and I was surprised. BASIC really does seem to take an eternity! I also developed a BASIC driver to display the numbers on the screen as they were being sorted by the machine language routine.

QUICKSORT IN Z80 ASSEMBLY

This routine will sort integers only, allowing for negative values. The following points may help to further clarify the assembly language program. The start address and length of the array to be sorted are passed to the routine to the storage area labelled "STADD" and "LENGTH". This is all that the routine needs to work on the data. The Basic stack is saved on initialization, because Quicksort will use the stack for its own operations to store sublist bounds. Then the lower and upper bound addresses are found and pushed onto the stack. Consideration is given to the fact that each item occupies 2 bytes (integers). "PARTN" involves checking if the stack is empty by comparing original stack address with current value of stack pointer. If empty, then the sort is complete. If not, the next sublist bounds are popped and stored in locations labelled "LOWER" and "UPPER". J-FLAG refers to the toggle flag, being the C register. The indices are check for equality. If not equal, then "CMPARE" is called to compare the items pointed to by HL and DE (indices). This particular version does not check which sublist is greater, but processes the right sublist before the left. This involves checking to see if they contain more than 1 integer, and if so, their bounds are stacked, else processing returns to "PARTN" to partition the next sublist. "CMPARE" involves getting the actual integers (items being compared) pointed to by HL and DE, into HL and DE for easy comparison. Then the sign status is checked for both integers using logical operation "XOR". If they have the same signs, then their signs are irrelevant in their ordering. Because negative integers are stored in two's complement form. If their signs are not the same, then a further check is made in "UNEQU" to check the sign in HL. Swapping two items is done most efficiently by using the EX DE, HL instruction. The task of placing the items in the HL and DE registers back into the sort array is the reverse of the process found in "CMPARE". Since a swap was done, the flag in the C register is toggled. "TESTJ" involves testing the status of the toggle flag to determine which index to update for the next comparison process.

```
                00100 ; PARTITION-EXCHANGE SORT (QUICKSORT).
                00200 ; CALLED FROM BASIC AFTER PASSING START ADDRESS
                00300 ; AND LENGTH OF ARRAY TO BE SORTED.
                00400 ; AUTHOR:        B. SIMSON
                00500 ; COPYRIGHT (C) 1980
                00600 ;
7F00            00700           ORG     7F00H
7EFF            00800 STACK     DEFL    STADD-1 ;NEW STACK
7F00 0000       00900 STADD     DEFW    0       ;START ADDR
7F02 0000       01000 LENGTH    DEFW    0       ;LENGTH OF ARRAY
7F04 0000       01100 LOWER     DEFW    0       ;BOUNDS OF DATA
7F06 0000       01200 UPPER     DEFW    0       ;  CURRENTLY BEING PROCESSED
7F08 0000       01300 STKSAV    DEFW    0       ;BASIC SP
                01400 ;
7F0A ED73087F   01500 START     LD      (STKSAV),SP     ;SAVE BASIC STACK
7F0E 31FF7E     01600           LD      SP,STACK        ;INITIALIZE NEW
7F11 08         01700           EX      AF,AF'          ;SAVE BASIC REGISTERS
7F12 D9         01800           EXX
7F13 ED5B007F   01900           LD      DE,(STADD)      ;START ADDR
7F17 2A027F     02000           LD      HL,(LENGTH)     ;IN INTEGERS
7F1A 29         02100           ADD     HL,HL           ;IN BYTES
7F1B 19         02200           ADD     HL,DE           ;HL=END+2
7F1C 2B         02300           DEC     HL
7F1D 2B         02400           DEC     HL
7F1E EB         02500           EX      DE,HL           ;HL=START,DE=END
7F1F E5         02600           PUSH    HL              ;LOWER
7F20 D5         02700           PUSH    DE              ;UPPER
7F21 21FF7E     02800 PARTN     LD      HL,STACK        ;STACK EMPTY?
7F24 B7         02900           OR      A
7F25 ED72       03000           SBC     HL,SP
7F27 CA417F     03100           JP      Z,RETN          ;YES
7F2A D1         03200           POP     DE              ;UPPER
7F2B E1         03300           POP     HL              ;LOWER
7F2C 22047F     03400           LD      (LOWER),HL      ;STORE
7F2F ED53067F   03500           LD      (UPPER),DE      ;  BOUNDS
7F33 0E01       03600           LD      C,1             ;SET J-FLAG
7F35 E5         03700 CHEKEQ    PUSH    HL              ;I=J? (HL=DE?)
7F36 B7         03800           OR      A
7F37 ED52       03900           SBC     HL,DE
7F39 E1         04000           POP     HL
7F3A 280C       04100           JR      Z,RIGHT         ;Z IF I=J
7F3C CD7B7F     04200           CALL    CMPARE          ;COMPARE ITEMS
7F3F 18F4       04300           JR      CHEKEQ
7F41 ED7B087F   04400 RETN      LD      SP,(STKSAV)     ;RESTORE BASIC SP
7F45 D9         04500           EXX                     ;RESTORE REGISTERS
7F46 08         04600           EX      AF,AF'
7F47 C9         04700           RET
7F48 2A067F     04800 RIGHT     LD      HL,(UPPER)      ;CHECK RIGHT SUBLIST SIZE
7F4B B7         04900           OR      A
7F4C ED52       05000           SBC     HL,DE           ;SIZE*2 IN HL
7F4E 7C         05100           LD      A,H             ;CHECK MSB
7F4F FE00       05200           CP      0
7F51 2005       05300           JR      NZ,PUSHR        ;RIGHT SUBLIST BOUNDS
7F53 7D         05400           LD      A,L             ;LSB
7F54 FE04       05500           CP      4               ;=2 INTEGERS
7F56 3809       05600           JR      C,LEFT          ;C IF HL<=4 (2 INT)
7F58 D5         05700 PUSHR     PUSH    DE              ;DE TO HL (DIVIDER)
7F59 E1         05800           POP     HL
7F5A 23         05900           INC     HL
7F5B 23         06000           INC     HL              ;NEXT INT
7F5C E5         06100           PUSH    HL              ;LOWER
7F5D 2A067F     06200           LD      HL,(UPPER)
7F60 E5         06300           PUSH    HL              ;UPPER
7F61 2A047F     06400 LEFT      LD      HL,(LOWER)      ;CHECK LEFT SUBLIST SIZE
7F64 EB         06500           EX      DE,HL           ;(HL)=DIVIDER,(DE)=LOWER
7F65 B7         06600           OR      A
7F66 ED52       06700           SBC     HL,DE           ;SIZE*2 IN HL
7F68 7C         06800           LD      A,H             ;SAME AS RIGHT ABOVE
7F69 FE00       06900           CP      0
7F6B 2006       07000           JR      NZ,PUSHL
7F6D 7D         07100           LD      A,L
7F6E FE04       07200           CP      4
7F70 DA217F     07300           JP      C,PARTN
7F73 D5         07400 PUSHL     PUSH    DE              ;LOWER
7F74 2B         07500           DEC     HL              ;PREV INT
7F75 2B         07600           DEC     HL              ;  DISPLACEMENT FROM LOWER
7F76 19         07700           ADD     HL,DE           ;HL=UPPER
7F77 E5         07800           PUSH    HL
```

```
7F78 C3217F    07900          JP      PARTN
7F7B D5        08000 CMPARE   PUSH    DE              ;SAVE ADDRESS
7F7C E5        08100          PUSH    HL              ;  POINTERS
7F7D 7E        08200          LD      A,(HL)          ;GET LEFT INT
7F7E 23        08300          INC     HL              ;  BY LD HL,(HL)
7F7F 66        08400          LD      H,(HL)
7F80 6F        08500          LD      L,A
7F81 EB        08600          EX      DE,HL           ;LEFT INT IN DE
7F82 7E        08700          LD      A,(HL)          ;GET RIGHT INT
7F83 23        08800          INC     HL
7F84 66        08900          LD      H,(HL)
7F85 6F        09000          LD      L,A
7F86 EB        09100          EX      DE,HL           ;HL=LEFT,DE=RIGHT
7F87 7C        09200          LD      A,H             ;CHECK SIGNS
7F88 AA        09300          XOR     D               ;  H WITH D
7F89 FAAB7F    09400          JP      M,UNEQU         ;M IF SIGNS NOT EQ
7F8C E5        09500          PUSH    HL              ;SAVE LEFT
7F8D B7        09600          OR      A
7F8E ED52      09700          SBC     HL,DE           ;COMPARE INTEGERS
7F90 E1        09800          POP     HL              ;RESTORE
7F91 381E      09900          JR      C,OK            ;NO
7F93 281C      10000          JR      Z,OK            ;  SWAP
7F95 EB        10100 SWAP     EX      DE,HL           ;SWAP INT
7F96 7C        10200          LD      A,H             ;PUT LEFT BACK
7F97 45        10300          LD      B,L
7F98 E1        10400          POP     HL              ;ADDR OF DEST
7F99 23        10500          INC     HL
7F9A 77        10600          LD      (HL),A          ;MSB
7F9B 2B        10700          DEC     HL
7F9C 70        10800          LD      (HL),B          ;LSB
7F9D 7A        10900          LD      A,D             ;PUT RIGHT BACK
7F9E 43        11000          LD      B,E
7F9F D1        11100          POP     DE              ;ADDR OF DEST
7FA0 13        11200          INC     DE
7FA1 12        11300          LD      (DE),A          ;MSB
7FA2 1B        11400          DEC     DE
7FA3 78        11500          LD      A,B             ;GET LSB
7FA4 12        11600          LD      (DE),A          ;LSB
               11700 ;  TOGGLE FLAG
7FA5 3E01      11800          LD      A,1
7FA7 A9        11900          XOR     C               ;J-FLAG
7FA8 4F        12000          LD      C,A
7FA9 1808      12100          JR      TESTJ
7FAB 7C        12200 UNEQU    LD      A,H             ;CHECK HL SIGN
7FAC E680      12300          AND     80H
7FAE F2957F    12400          JP      P,SWAP          ;P IF HL (+) (HIGHER)
7FB1 E1        12500 OK       POP     HL              ;NO SWAP
7FB2 D1        12600          POP     DE
7FB3 79        12700 TESTJ    LD      A,C             ;TEST J-FLAG
7FB4 B7        12800          OR      A
7FB5 2003      12900          JR      NZ,DECR         ;NZ IF SET
7FB7 23        13000          INC     HL              ;NEXT INT
7FB8 23        13100          INC     HL              ;  FOR LOWER
7FB9 C9        13200          RET
7FBA 1B        13300 DECR     DEC     DE              ;PREV INT
7FBB 1B        13400          DEC     DE              ;  FOR UPPER
7FBC C9        13500          RET
7F0A           13600          END     START
```

BASIC DRIVER

The following BASIC program will drive the sort routine. Of course, before calling the sort, the necessary parameters must be passed to it. These are the start address of the unsorted array, and the number of integers it contains for sorting. this is done in lines 1220-1250. Line 1210 pokes the entry point for the USR (0) function, which is used to invoke the machine language program. The destination of the parameters is known by the assembly program, and these are poked into their correct locations, least significant byte first. It is important at this point to mention that once the start address of the array is found by the VARPTR function, no other variables should be defined before calling the sort, since defining further scalar variables will generate an entry in the simple variable table, thereby shifting up the array, which will then have a different starting address. An option is provided for a visual presentation, with optional graphic characters to be included. If a delay is built in the machine language program, you may be able to see the workings of the algorithm as execution proceeds. To get the program running you should first protect memory at 32500 at the MEMORY SIZE question. Then load in the machine language routine using SYSTEM if a tape has been made, or by direct load with a

monitor. Then load in the BASIC driver and run.

```
1000 '     PARTITION-EXCHANGE SORT DRIVER (QUICKSORT)
1010 '     AUTHOR:          B SIMSON, COPYRIGHT (C) 1980.
1020 '     THE SORT PROGRAM IS WRITTEN IN Z-80 ASSEMBLY
1030 '     AND IS CALLED FROM THIS DRIVER BY A USR(0) CALL
1040 '     AFTER START ADDR & LENGTH OF DATA PARAMETERS PASSED.
1050 '               SORT:  ASCENDING
1060 '               DATA TYPE:  SIGNED INTEGER ARRAY
1070 '               SUITABLE FOR: LEV2, 16K.
1090 DEFINTA-Y:RANDOM:Z$="":R=0:D=0
1100 PRINTTAB(20);"QUICKSORT ROUTINE"
1110 INPUT"VISUAL DEMO (Y/N)";V$:IFV$="Y"THEN1360
1120 INPUT"SIZE OF DATA LIST";L
1130 DIM A(L)
1140 PRINTTAB(10);"GENERATING RANDOM INTEGERS..."
1150 FORI=1TOL
1160     A(I)=RND(1000)-200   ' GENERATE TYPICAL SIGNED DATA
1170 NEXT
1180 PRINT"BEFORE SORT":GOSUB1320
1190 S=VARPTR(A(1))
1200 GOSUB1210:GOTO1260
1210 POKE16526,10:POKE16527,127          ' ENTRY=7F0AH
1220 POKE32512,S AND 255                 ' START @ 7F00H
1230 POKE32513,(S/256) AND 255
1240 POKE32514,L AND 255                 ' LENGTH @ 7F02H
1250 POKE32515,(L/256) AND 255:RETURN
1260 PRINT:INPUT"HIT ENTER TO START THE SORT";S
1270 PRINT:PRINTTAB(10);"SORTING..."
1280 S=USR(0)                            ' SORT ROUTINE
1290 PRINT"AFTER SORT:"
1300 GOSUB1320
1310 END
1320 FORI=1TOL
1330     PRINTA(I);
1340 NEXT
1350 RETURN
1360 '   VISUAL DEMO DATA
1370 V$="":INPUT"GRAPHIC & SPL CHARS INCL";V$
1380 IFV$="Y"THENR=159:D=32 ELSE R=26:D=64
1390 CLS:PRINTCHR$(23):FORI=15360TO16382STEP2
1400 POKEI,RND(R)+D:POKEI+1,32
1410 NEXT
1420 S=15360:L=512
1430 GOSUB1210
1440 Z$="":Z$=INKEY$:IFZ$=""THEN1440
1450 S=USR(0)
1460 Z$="":Z$=INKEY$:IFZ$=""THEN1460
1470 END
```

EFFICIENCY

Quicksort performs well on large lists sizes. It does not have the same property as Bubble, etc., where sort times increase dramatically as the list size increases linearly. Its efficiency is similar to diminishing-increment and tree sort - of the order of $n \log_2 n$. This algorithm is one of the fastest that I have come across for average random data. There are algorithms around which will outperform this one, but only for special forms of data, e.g. the Radix sort is extremely fast on numbers which have a limited number of digits. Also, Quicksort does not perform very well on semi-ordered lists, because of uneven sublist sizes generated in the partitioning process, but for general cases of random data, it is one of the fastest. I performed some timing tests and compared them with those for the SupersnappX Sort published by Snapp Software, which compares their sort with Racet GSF. These are the results for 10,000 integers:

Racet GSF	59 seconds
SupersnappX	39 seconds
Quicksort	31 seconds

Snapp claim that SupersnappX is guaranteed to be the fastest in-memory sort on the market, which may be true since this version of Quicksort isn't on the market, but this comparison gives you an idea of its efficiency. Timing figures for some other list sizes for Quicksort are:

1,000 integers	2.2 seconds
2,000 integers	5.4 seconds
3,000 integers	8.1 seconds
4,000 integers	11.3 seconds

These were obtained on a Level 2 TRS-80 running at 1.7 MHz. In "The Art of Computer Programming, Volume 3 - Sorting and Searching", by D.E. Knuth, he compares Quicksort's efficiency with that of the diminishing increment sort, or "Shellsort" (discussed in the fourth article in this series). He shows that in the average case, Shellsort will take $15*n^{1.25}$ time units, and Quicksort $11.67*n*Log_e n - 1.74n$ time units, where n is the number of items being sorted. He also indicates that the maximum time for Shellsort is less than for Quicksort, a point which was referred to above. For comparison, the formalae for the average case were applied to give the following figures:

LIST SIZE	SHELLSORT	QUICKSORT
200	11281 Time Units	12018 Time Units
500	35465	35392
1000	84351	78873
2000	200621	173925
4000	477162	380206
10000	1500000	1057000

You can see from this table that Quicksort is more efficient in the average case as the list size increases.

TO SUMMARIZE

A method of sorting by exchange techniques known as the Partition-Exchange sort is very efficient for the average case. Items are sorted by placing them in their correct final position in the list, producing sublists on either side of it, which contain values that belong in that sublist. One sublist is stored while the other is processed in the same manner. A stack is used to store the bounds of the stored sublist.

This ends my discussion of different internal sorting algorithms, although it is not an exhaustive list of algorithms available. It should be understood that no one algorithm is the best, since different algorithms suit different applications, and some present trade-offs in memory usage that would not be acceptable in other applications.

The next article will discuss record sorting and external sorting techniques.

- 0000000000 -

***** AUTOMATIC GRAPHICS PACKER - by Ken B. Smith *****

Those of you who struggled through my article on STRING$ & THING$ will by now have had enough practice at string packing to appreciate the time that even a simple graphic shape can consume. Even so the savings in memory and the increase in speed makes it all worthwhile. This program will enable you to draw a graphics design on the screen and automatically pack it into a string for you. This and other features make it well worth the effort to type in. What follows are simple instructions. The program itself is well REMed and those who wish will be able to decipher its logic without much effort. The REM's may be omitted for speed and ease when typing in.

Once the program is loaded and RUN the screen will request information on 'STRING NUMBER AND LENGTH TO PACK'. If the buffer contains information then answer this question with the string to pack and number of bytes to transfer but if you are starting afresh, either with a new design or a whole new run, then just press ENTER.

Once this question has been answered the screen will clear and a graphics pixel will be flashing in the centre of the screen. This single flashing pixel indicates the CURSOR Mode and all commands are available from this section. You may move this cursor around using the arrow keys, holding down the SPACE BAR will erase or leave a blank. The following commands are available from this mode using the appropriate key. (Be sure to have upper-case selected).

(P) - Pack the design on the screen to the buffer for subsequent transfer to a string. The buffer has a maximum capacity of 250 bytes so do not try too big a design to start with or problems will result from the buffer eating the program.

(C) - Clears the screen and leaves the cursor in the last position.

(R) - Repeat the contents of the buffer onto the screen. Useful for progressive animation sequences.

(A) - Enters the ASCII mode. This will show a large cursor which will respond to arrow keys to move without altering the existing graphics, or will place any selected keyboard characters onto the screen. Pressing ENTER returns control to the CURSOR mode. Auto repeat is available after about a third of a second.

(J) - If you have a printer with graphics capability this will dump the screen to paper. Initialising your printer to the correct mode is your problem. The dump is straight ASCII and emulates the JKL features of NEWDOS. As this information is taken straight from the screen, no lower case is acceptable and this is the reason the LC is not available in the ASCII mode.

Once the pack command has been given, the contents of the screen will be transferred to the buffer. when this is completed you will be informed of the number of bytes transferred. Edit the string array to which you wish this design to be copied to the exact number of bytes required. (You won't be able to later !!!!). The line number equals the string number +10. To aid with this chore the target strings are set to 100 bytes. Delete or add enough characters to suit your design and RUN. This time answer the question about target and length with this information. The buffer will be transferred to the target string. When this is completed, you will be back to BASIC. ReRUN the program without an entry for the first question and you will be ready to make your second design.

Once you have completed your designs, merely delete all those lines not required and write your program on top of the packed strings. DO NOT ATTEMPT TO EDIT THE PACKED LINES.

This program is a fully functioning utility, but there are many other extras that could be added. Please feel free to add anything you wish, I would be pleased to see anything extra you might add. For myself I have completely automated this program, it even edits its own line numbers, but how to manage that is altogether another story.....

- 0000000000 -

```
0 '****** Automatic Graphics Packer *********
1 '******   Written for Micro 80    *********
2 '******            by             *********
3 '******        Ken B Smith        *********
4 CLEAR500 :'** 500 Bytes for String$
5 CLS :'** Clear Le Screen
6 DEFINTA-K,M-Z :'** Set up the integers
7 A=15360 :'** Start of Screen Memory in A
8 C=191 :'** Whole graphic in C
9 DIMA$(10) :'** Set up the array for A$
10 '** The Variables A(1) to A(9) all have 100 blanks
11 A$(1)="
                                        "
12 A$(2)="
                                        "
13 A$(3)="
                                        "
14 A$(4)="
                                        "
15 A$(5)="
                                        "
16 A$(6)="
                                        "
17 A$(7)="
                                        "
18 A$(8)="
                                        "
19 A$(9)="
                                        "
20 '** A$ has 250 blanks and is the Buffer
21 A$="


            "
22 Z9$=" " :'** A dummy string used in the screen print
23 INPUT"STRING NUMBER AND  LENGTH TO PACK ";ZZ,Z1
24 CLS
25 X=63:Y=23 :'** Start positions for cursor
26 F$=INKEY$ :'** Strobe Keyboard and result to F$
27 IFF$="A"THEN48 :'** Was it an "A" for ASCII mode ?
28 IFF$="C"THENCLS:GOTO26 :'** or a "C" for CLS
29 IFF$="P"THEN67 :'** or a "P" for PACK
30 IFF$="J"THENGOSUB108:GOTO26 :'** or"J" for Screen Print
31 IFF$="R"THENCLS:PRINT@468,A$ :'** or an "R" for REPEAT
32 B=PEEK(14590) :'** Load B with cursor arrow PEEK
33 '** If B=0 then Flash Cursor and back to get next job
34 IFB=0THENRESET(X,Y):FORX1=1TO10:NEXT:SET(X,Y):GOTO26
35 '** Check for 00001000 = Up arrow and dec Y but not < 0
36 IFBAND8THENY=Y-1:IFY<0THENY=0
37 '** Check for 00010000 = Down arrow and inc Y but not > 47
38 IFBAND16THENY=Y+1:IFY>47THENY=47
39 '** Check for 0010000 = Left arrow and dec X but not < 0
40 IFBAND32THENX=X-1:IFX<0THENX=0
41 '** Check for 0100000 = Right arrow and inc X but not > 127
42 IFBAND64THENX=X+1:IFX>127THENX=127
```

```
43 SET(X,Y) :'** SET the new value for X & Y
44 '** Check for 1000000 = Space Bar then RESET pixel and pause
45 IFBAND128THENRESET(X,Y):FORX1=1TO5:NEXT
46 GOTO26 :'** Back for more inputs
47 '** The ASCII input section
48 D=PEEK(A) :'** Peek the Screen location in A, result in D
49 POKEA,C :'** Poke the Graphic Byte 191 into Screen Location
50 B$=INKEY$ :'** INKEY$ result to B$
51 '** If there is nothing from the Keyboard, Flash cursor
52 IFB$=""THENPOKEA,32:FORI=1TO10:NEXT:POKEA,D:GOTO48
53 B=ASC(B$) :'** There was an entry. ASCII code to B
54 IFB=13THENPOKEA,D:GOTO26 :'** Was it an ENTER, then back
55 '** If entry a valid character, POKE it in and inc A
56 IFB>31ANDB<91THENPOKEA,B:A=A+1:IFA>16383THENA=16383
57 '** The following are cursor controls. POKEA,D = Skip
58 '** If entry was Left arrow then dec A and check A>15359
59 IFB=8THENPOKEA,D:A=A-1:IFA<15360THENA=15360
60 '** If entry was Right arrow then inc A and check A<16384
61 IFB=9THENPOKEA,D:A=A+1:IFA>16383THENA=16383
62 '** If entry was Down arrow then inc A+64 (1 line) and check
63 IFB=10THENPOKEA,D:A=A+64:IFA>16383THENA=A-64
64 '** If entry was Up arrow then dec A-64 and check
65 IFB=91THENPOKEA,D:A=A-64:IFA<15360THENA=A+64
66 GOTO48 :'** Back again
67 IFZZ<>0THEN100 :'** Is there a String Number from the entry
68 LO=VARPTR(A$) :'** There wasn't so address of buffer to LO
69 LO=PEEK(LO+1)+256*PEEK(LO+2) :'** Now the address of A$
70 IFLO>32768THENLO=LO-65536 :'** Check for INT limits
71 L1=LO :'** Transfer to spare L1
72 FORX=15360TO16383STEP64 :'** The whole screen, in lines
73 FORZ=X+63TOXSTEP-1 :'** now the lines, one byte at a time
74 IFPEEK(Z)=32ORPEEK(Z)=128THENNEXT:NEXT:GOTO94 :'** Blanks?
75 C1=Z :'** First non blank character. Position to C1
76 FORZ=XTOC1 :'** Now forwards along the line
77 IFPEEK(Z)=32ORPEEK(Z)=128THENNEXT :'** to check for blanks
78 C=Z :'** First entry on line non-blank to C
79 FORZ=CTOC1 :'** Characters in the range C to C1 on this line
80 POKELO,PEEK(Z) :'** Poke them to the buffer string (A$)
81 LO=LO+1 :'** Increment the buffer string pointer
82 NEXT :'** Continue till that line completed
83 XX=X+64 :'** Go down one line
84 FORZ=XXTOXX+63 :'** And check it
85 IFPEEK(Z)=32ORPEEK(Z)=128THENNEXT:NEXT :'** Check for blanks
86 POKELO,26 :'** Put in a line feed
87 LO=LO+1 :'** And don't forget the buffer counter
88 C2=Z :'** Hold present position in C2
89 FORZ=C2TOC1+64 :'** End of top line to start of next
90 POKELO,24 :'** Poke in backspace characters
91 LO=LO+1 :'** And increment the pointer each time
92 NEXT :'** until enough back spaces are entered
93 IFX<16380THENNEXT :'** End of Screen - No, another line
94 X=LO-L1 :'** Number of characters into X
95 CLS :'** Must I do that again
96 PRINT"THERE ARE ";X; "STATEMENTS IN THAT DRAWING
97 PRINT"EDIT THE REQ. LINE AND ENTER STRING NUMBER AND BYTES NEXT RUN
98 END :'** End of packing. Easy heh!!!!
99 '** Transfer from buffer (A$) to selected string A$(ZZ)
100 LO=VARPTR(A$(ZZ)) :'** VLT address for selected string
101 LO=PEEK(LO+1)+256*PEEK(LO+2) :'** Actual address to LO
102 FORX=1TOZ1 :'** Number of Bytes to transfer
103 POKELO,ASC(MID$(A$,X,1)) :'** Transfer from A$ to A$(ZZ)
104 LO=LO+1 :'** Increment the counter
105 NEXT :'** Until finished Z1 bytes
106 END :'** End of transfer from buffer to target string
107 '** The Screen Print Subroutine. Emulates JKL feature
108 Z9%=VARPTR(Z9$) :'** VLT address of dummy string Z9$
109 POKEZ9%,64 :'** Tell the interpreter it's 64 bytes long
110 FORZ8%=15360 TO 16383 STEP 64 :'** Screen in lines to Z8%
111 Z7%=Z8%/256 :'** Extract MSB of Z8% to Z7%
112 Z6%=Z8%-Z7%*256 :'** And the LSB of Z8% to Z6%
113 POKEZ9%+1,Z6% :'** Transfer LSB of screen line to VLT
114 POKEZ9%+2,Z7% :'** Transfer MSB of Screen line to VLT
115 LPRINTZ9$ :'** Now print that screen line as Z9$
116 NEXT :'** And continue till end of screen
117 RETURN :'** Then go back to caller
118 END :'** This really is the end
```

**** SOFTWARE SECTION ****

***** VARIABLE WORKSHEET Peach and CC *****

It is good programming practice to document programs as an aid to understanding how they work. At the time of writing a program, this procedure seems totally unnecessary because you are thoroughly familiar with the program, with its variable usage, and with how it functions. However, if your memory is like mine, when you come back to it after a month or so to tidy it up or improve it, you find that familiarity is gone and that you waste a lot of time trying to recover it. With this program, first published in the April '81 issue, you can record much of this precious information systematically to serve as documentation for future reference (a printer is required).

- 00000000000 -

***** MILEAGE CALCULATOR Peach and CC *****

With the aid of this program, originally published in the July '81 issue, you can use your computer to keep a record of your car's fuel consumption. The program originally used cassette tape to store the information for a particular month and these modified versions do the same. The program allows you to enter the data, make projections about fuel requirements, etc. and to produce summaries.

(1)	month number	(4)	litres
(2)	km at start	(5)	cost
(3)	km at end		

The program then works out:

(1)	kms travelled	(4)	m.p.g.
(2)	miles travelled	(5)	litres per 100 km
(3)	km/litre		

After this is done the user is asked if the data is to be saved to cassette. When completed, the program returns to the menu.

The second function projects the number of litres of fuel required for a given trip, given the average km/litre and the distance.

The summary mode allows you to summarise a particular month, or the full year. Given the month, the program will search the data tape (provided one has been created) and when it finds the specified month it will load the data and summarise under these headings:

TOTAL COST TOTAL KM(TRAVELLED) AVG KM/LITRE TOTAL LITRES

When asked to do a summary for the year, the data for all the months is read and summarised. Note that in this mode, the last month read must be a 12 or an error will result.

- 0000000000 -

***** CALENDAR - LEVEL II *****

A program that produces a calendar seems appropriate at this time of year and this one follows the same sort of logic that a person would if the exercise were to be done by hand. In order to produce any calendar you need two pieces of information:

1) the day of the week when the year begins
2) if the year is a leap year or not.

Given the year for which you want the calendar, there is an algorithm called Zeller's algorithm that generates a unique day number for any day this century starting from March 1st., 1900 (hence the restriction on the year). With that it is a relatively simple task to find the first piece of information. Knowing the year allows you to quite easily get the second. Although I have not tested this program for all the 99 years this century, my confidence in Zeller and modulo arithmetic leads me to believe the code in lines 650 - 670 is correct and it does produce an accurate calendar for 1983.

The remainder of the program is concerned with formatting the layout of the calendar and is reasonably self-explanatory. The subroutine at 220 generates the calendar in a numeric array YR and that at 440 converts this array to character strings for printing one line at a time. The title is printed by the subroutine at 290. Line 200 puts my EPSON into double-strike mode and line 750 restores it to normal, followed by a hard form feed (the System 80 does not pass

MICRO-80 PRODUCTS CATALOGUE

This catalogue contains a selection from the wide range of peripherals, interfaces, computers and software carried by MICRO-80 for your computer. If you don't see the item you want, contact us, we probably have it anyway!

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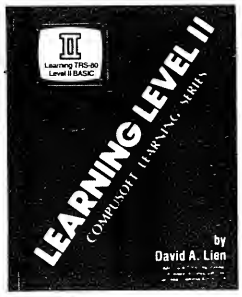

LEARNING LEVEL II
by David A. Lien

Written by the author of the Level I Users Manual, *Learning Level II* covers all Level II BASIC beyond Level I, plus much more. It shows you how to use the Editor, explains what the many error messages are really saying, and leads you through conversions of Level I programs to Level II.
Dual cassettes, printers, the Expansion Interface with clock and other features are explained in the same easy-to-learn style that made the Level I Manual famous. *Learning Level II* is an invaluable supplement to the TRS-80 Level II and System 80 manuals and is now only $7.95 (plus $1.20 p&p).

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by H.C. Pennington

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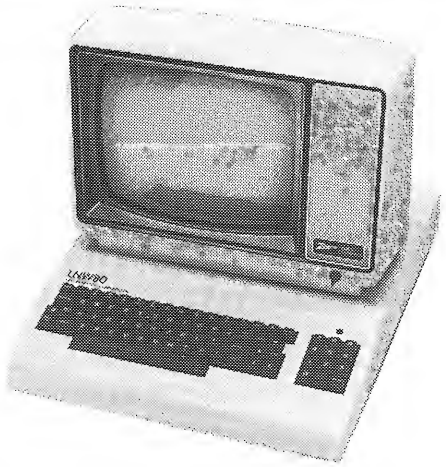
THE LNW80 MkII MICROCOMPUTER



Manufactured in America by LNW Research Corporation, the LNW80 II has the following outstanding features:

- Completely software and hardware COMPATIBLE with the TRS-80 Model 1.
- HIGH RESOLUTION COLOUR GRAPHICS — 4 MODES:
  - B/W LO-RES 128 x 48
  - B/W HI-RES 480 x 192
  - COLOUR LO-RES 128 x 192 in 8 COLOURS
  - COLOUR HI-RES 480 x 192 in 8 COLOURS
- CP/M Disk Operating System.
- Single and Double Density Disk Operation.
- Supports 5¼ inch or 8 inch Floppy Disk Drives.
- 48K RAM in TRS-80 mode plus 16K High Resolution graphics RAM.
- 64K RAM in CP/M mode plus 32K Banked in, usable in BASIC, plus the 16K High Resolution Graphics RAM.
- 4 MHz Z80A microprocessor — over twice the operating speed of the Model 1.
- HI-RES COLOUR (R-G-B) and B&W video outputs.
- 3 screen display modes:
  - 64 characters x 16 lines
  - 80 characters x 16 lines
  - 80 characters x 24 lines
- SOFTWARE SUPPORT

Apart from being able to run all TRS-80 Model 1 software and all CP/M software, there is also an extended BASIC interpreter available for the LNW80 II using most of the same commands as the TRS-80 Colour Computer but with full LNW Graphics Resolution, SET, RESET, POINT, LINE and CIRCLE as well as special commands to generate sound effects and tones. TRS-80 Colour Computer BASIC programs can be transferred to the LNW with only minor changes.

The LNW80 II is the ideal computer for the serious hobbyist or businessman who is seeking a higher performance, more reliable computer to replace his TRS-80 Model 1 without sacrificing his investment in software or his programming experience. The LNW80 II uses standard Tandy or Tandy compatible disk drives. If you already have a disk TRS-80 system you may continue to use your existing disk drives on the LNW80 II.

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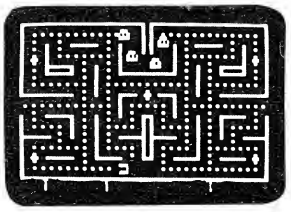
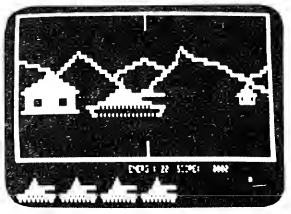


SCARFMAN

This incredibly popular game craze now runs on your TRS-80! It's eat or be eaten. You run Scrarfman around the maze, gobbling up everything in your path. Try to eat it all before nasty monsters devour you. Excellent high speed machine language action game from the Cornsoft Group. With sound.

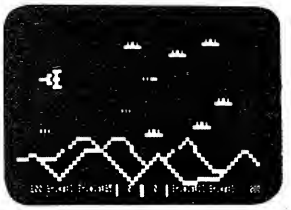
Price: $17.95



ARMORED PATROL

A realistic tank battle simulation. Your view is a 3--D perspective of an alien landscape. Maneuver your T-36 tank to locate and destroy enemy tanks and robots that lay hidden, ready to assault you. Clever graphics create the illusion of movement and dimension. From Adventure International. With sound.

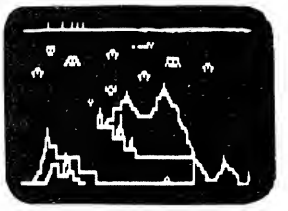
Price $32.00



REAR GUARD

Deadly waves of enemy Cyborg craft attack your fleet from the rear. You are the Mothership's sole defender. You have unlimited firepower but the Cyborgs are swift, nimble attackers. Your abilities are tested hard in this game of lightening fast action and lively sound from Adventure International.

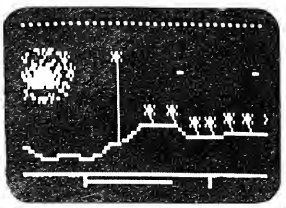
Price $26.50



STRIKE FORCE

As the primary defender of a world of cities under deadly alien attack, your weaponry is the latest rapid fire missiles, long range radar, and incendiary "star shells." Your force field can absorb only a limited number of impacts. A complex game of strategy, skill and reflexes from Melbourne House.

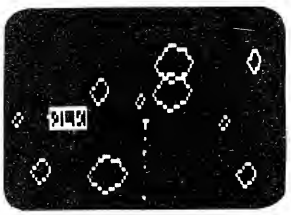
Price: $26.50



SEA DRAGON

Your submarine, the U S S Sea Dragon, penetrates a mined enemy channel. Armed with missiles and torpedos, you engage the enemy while navigating unknown waters. Succeed or come to a salty end in this game. 29 screens of horizontally scrolling sea-scrape and sound from Adventure International.

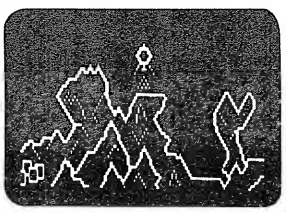
Price: $26.50



SUPER NOVA

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones). Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine.

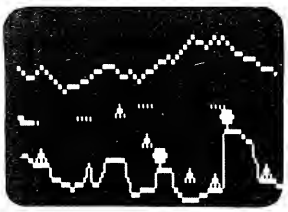
Price: $26.50



LUNAR LANDER

As a vast panoramic moonscape scrolls by, select one of many landing sights. The more perilous the spot, the more points scored -- if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS-80 graphics we have ever seen. From Adventure International. With sound.

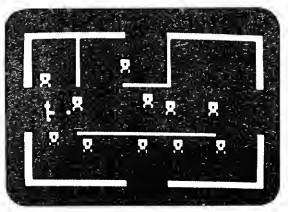
Price: $26.50



PENETRATOR

Soar swiftly over jagged landscape, swooping high and low to avoid obstacles and enemy missiles attacks. With miles of wild terrain and tunnels to penetrate, you're well armed with bombs and multiple forward missile capability. From Melbourne House. Features sound, trainer mode and customizing program.

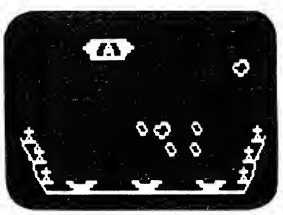
Price: $36.50



ROBOT ATTACK

Talks without a voice synthesizer, through the cassette port. With just a hand laser in a remote space station, you encounter armed robots. Some march towards you, more wait around corners. Careful, the walls are electrified. Zap as many robots as you dare before escaping to a new section. More robots await you.

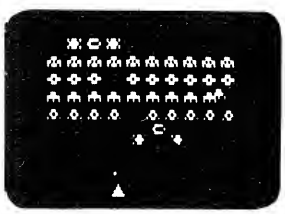
Price: $26.50



METEOR MISSION II

As you look down on your view, astronauts cry out for rescue. You must maneuver through the asteroids and meteors. (Can you get back to the space station?) Fire lasers to destroy the asteroids, but watch out, there could be an alien Flagship lurking. Includes sound effects!

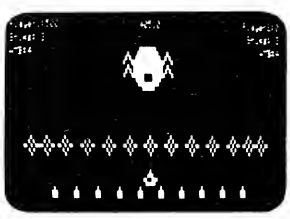
Price: $20.50



GALAXY INVASION

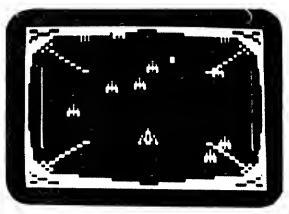
The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects!

Price: $26.50



DEFENSE COMMAND

The invaders are back! Alone, you defend the all important nuclear fuel canisters from the repeated attacks of thieving aliens, repeatedly. An alien passes your guard, snatches a canister and flys straight off. Quick! You have one last chance to blast him from the sky! With sound and voice.



STELLAR ESCORT

The latest super action game from Big Five. As the Federation's top space fighter you've been chosen to escort what is possibly the most important shipment in Federation history. The enemy will send many squadrons of their best fighters to intercept. With sound.

Price: $26.50

THE BEST IN ENTERTAINMENT FROM AMERICA'S TOP SOFTWARE HOUSES

MICRO-80 now has in stock some of the best games and adventures written for the '80s. These programs are supplied on cassette for the Level II/16K TRS-80 Model I (or III). They are also suitable for the System 80 but sound may not be available unless a hardware modification has been fitted to reverse the roles of recorders #1 and #2. Limited stock is available at these prices.

FROM BIG FIVE

COSMIC FIGHTER $20.95

Your ship comes out of hyperspace under a convoy of aliens, you destroy every one but another set appears, these seem more intelligent. You eliminate them too. Your fuel supply is diminishing. You must destroy 2 more sets before you can dock — includes sound effects.

ATTACK FORCE $26.50

In this fast paced, m/l game 8 alien ramships are warping towards your ship. You must dodge them and fire your missiles before they destroy you — but watch out for the flagship and its death beam!! — complete with sound effects.

FROM ADVENTURE INTERNATIONAL

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Your mission is to prevent the marauding alien hoards from recovering your energizers from the planet surface. There are several types of alien ships — each with different weapons to destroy you!! — with sound effects.

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This is a real-time game with sound effects. You must protect your cities against enemy missiles, as your skill increases, so does the level of difficulty making accuracy a must.

PLANETOIDS $26.50

It's your ship against a swarm of killer planetoids, as you try to destroy them before they destroy you — with sharp graphics and sound effects.

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Wander through an enchanted world trying to recover 13 lost treasures. You'll encounter wild animals, magical beings, and many other perils and puzzles. Can you rescue the Blue Ox from the quicksand? Or find your way out of the maze of pits?

MYSTERY FUN HOUSE $26.50

Can you even find your way in to the Strangest Fund House in existence let alone find your way completely through it or will you get kicked out when the park closes?

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"Yo ho ho and a bottle of rum . . ." Meet the pirate and his daffy bird along with many strange sights as you attempt to get out of your London flat and get to Treasure Island. Can you recover Long John Silver's lost treasures?

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Count Cristo has had a fiendish curse put on him by his enemies. There he lies, with you as his only hope. Will you be able to rescue him or is he forever doomed? Beware the Voodoo Man . . .

SAVAGE ISLAND $26.50

Part 1 — A small island in a remote ocean holds an awesome secret. Will you be the first to uncover it? **NOTE:** This is the first part of a larger adventure. It will be necessary to buy further tapes to complete the entire Adventure. **WARNING: FOR EXPERIENCED ADVENTURERS ONLY!**

THE COUNT $26.50

You wake up in a large brass bed in a castle, somewhere in Transylvania. Who are you, what are you doing here, and WHY did the postman deliver a bottle of blood? You'll love this adventure, in fact you might say it's Love at First Byte.

SAVAGE ISLAND $26.50

Part 2 — After struggling through Part 1, you have the consolation of knowing it's half over. This concludes the two part Adventure. It requires you have completed Part 1 and received the password to start Part 2.

STRANGE ODYSSEY $26.50

Marooned at the edge of the galaxy, you've stumbled on the ruins of an ancient alien civilization complete with fabulous treasures and unearthly technologies. Can you collect the treasures and return home or will you be marooned forever?

GOLDEN VOYAGE $26.50

WARNING: For Experienced Adventurers Only! The King lies near death in the royal palace—you have only three days to bring back the elixir to cure him. Journey through the lands of magic fountains and sacred temples, stormy seas and gold, gold, GOLD!

BUY YOUR MODEL 3 FROM MICRO-80 AND SAVE $00's

MICRO-80 fits reliable MPI disk drives to the TRS-80 Model 3 to give system capacities and capabilities far in excess of those available elsewhere. All our conversions utilise low dissipation, switching-mode supplies to avoid screen jitter and overheating. The disk controller boards used incorporate special compensation circuitary for 80 track disk drives and may also be used to run 8 inch disk drives with an appropriate cable and DOS.

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2 40 TRACK SINGLE-HEAD DISK DRIVES GIVING
350K FORMATTED STORAGE, 48K RAM

MODEL 340+ **$3350**

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MODEL 500 — 5+ MEGABYTE MODEL 3 **$5895**

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OF FLOPPY DISK STORAGE FOR TRANSFERRING
PROGRAMS AND BACKUP, 48K RAM, EXTERNAL
5 MEGABYTE WINCHESTER SUB-SYSTEM,
DOSPLUS 4.0 DISK OPERATING SYSTEM
The MODEL 500 offers the high speed, mass storage capacity and reliability of a Winchester drive for thousands of dollars less than you would pay for any comparable system. Model 500 is a serious business computer able to tackle the most demanding tasks.

WINCHESTER DISK DRIVE SUB-SYSTEM **5MByte $2995**
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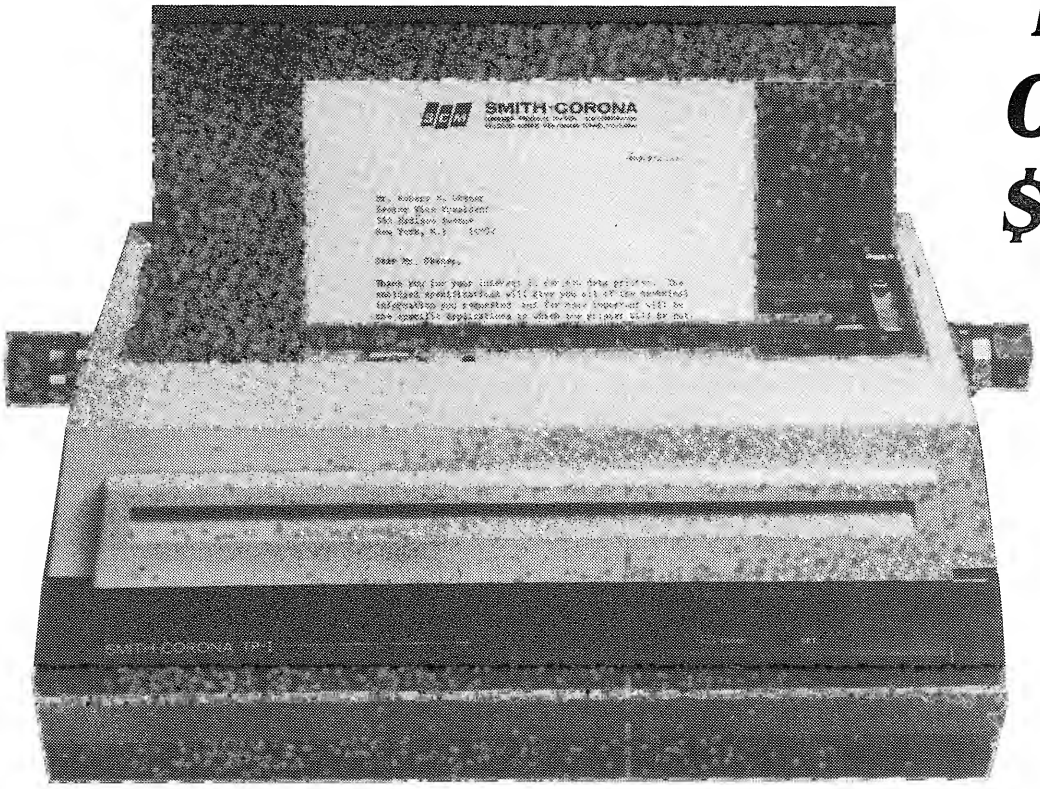
Prices include Sales Tax and are subject to change without notice. Prices are FOB Adelaide. Add $20 road freight anywhere in Australia. All computers and peripherals carry MICRO-80's Australia-wide. 90-day warranty covering parts and labour.

NEW

THE SMITH-CORONA TP-1 DAISY WHEEL PRINTER

A low-priced letter quality printer



For Only $999

Ideally suited for small businesses or the home user, the TP-1 is a microprocessor controlled, correspondence quality printer that prints fully formed characters at an average print speed of 12 characters per second. This simple to operate, compact printer is compatible with most microcomputers and comes with the standard Centronics parallel interface (an optional serial data interface is available) and features:

- 128 ASCII Character Set (88 printable)
- 10 CPI or 12 CPI character spacing
- 105 characters per line (or 126 in 12 pitch)
- Handles letter and legal sized paper (up to 13" wide)
- Variable line spacing and impression control
- Prints original plus up to three copies

☆*NEW* ☆ *NEW* ☆ *NEW* ☆ *NEW* ☆

Tractor Feed Mechanism for Daisy Writer (ET121) $380

Now your Daisywriter 2 can handle continuous stationery. Ideal for invoices and statements, etc.

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DOSPLUS 3.4 **$$149.95**
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With a high degree of compatibility with TRSDOS, DOSPLUS 3.4 supports single- or double-sided, single or double density, 5″ or 8″ disk drives with any track count (up to 96). Suitable for the first-time or experienced user wanting a fuss-free, bug-free, easy to understand but very powerful DOS which supports variable length records up to 255 bytes long. Comes with a stand alone manual.

ENHBAS **$52.95**
ENHBAS adds over 30 new commands and functions to your BASIC interpreter including high speed SORT, labels in BASIC, RESTORE to any line number, WHILE-WEND for structured programming, SCROLL, LEFT, INVERT, DRAW and PLOT to give you ease of control over graphics, SOUND and PLAY to add realistic sound effects and many more. Makes programming a breeze! Available for Model I or III, disk or cassette — specify which when ordering.

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Newdos 80 suits the experienced user who has already used TRSDOS, understands the manual and is prepared to learn the somewhat complicated syntax of one of the most powerful DOS's available. With the correct hardware, Newdos 80 supports any mix of single- or double-sided, single or double density, 5″ or 8″ disk drives with track counts up to 96. It provides powerful, flexible file handling in BASIC including variable length records up to 4096 bytes. Definitely not for the beginner.

MASTER DISK DIRECTORY **$20.95**
FIND THE PROGRAM FAST!! PAYS FOR ITSELF BY RELEASING REDUDANT DISK SPACE!! MASTER DIRECTORY records the directories of all your individual disks onto one directory disk. Then it allows you examine them, find an individual file quickly, list files alphabetically, weed out redundant files, identify disks with free space, list files by extension, etc., etc. This program is invaluable for the serious disk user and will pay for itself many times over.

THE FLOPPY DOCTOR/MEMORY DIAGNOSTIC
Model I Disk **$36.50** Model III Disk **$43.50**
THE MICRO CLINIC offers two programs designed to thoroughly check out the two most trouble-prone sections of the TRS-80 — the disk system (controller and drives) and the memory arrays. Both programs are written in Z80 machine code and are supplied together on diskette for a minimum 32K, one disk system. Specify Model I or Model III.

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If you can not go any further this will give you clues that may help — written by Scott Adams for Adventures 1—9.

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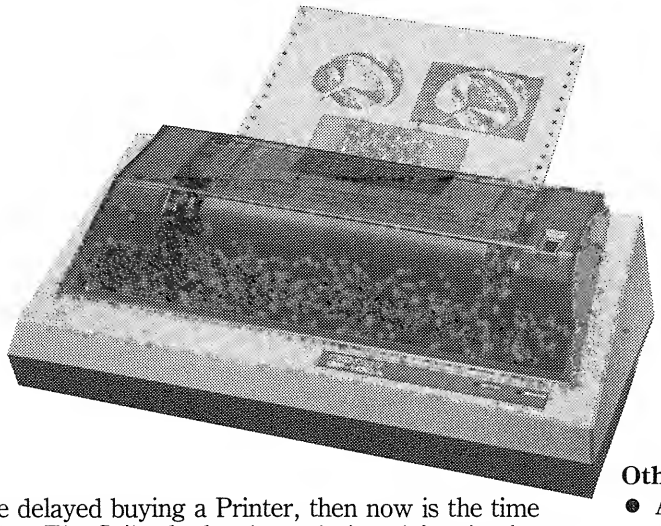
Deathmaze 5000 is another 3-D adventure. You move through a 5 storey building — your goal is to leave the deathmaze alive.

New
SEIKOSHA GP-100A GRAPHICS PRINTER



PRICED AT ONLY $475

If you have delayed buying a Printer, then now is the time to reconsider. The Seikosha has been designed for simple operation and puts full dot addressable graphics at your command. You can repeat a column of data as many times as you like with just one command. Double-width character and dot addressable positioning are software controlled.

Other features:

- Automatic Printing avoiding data loss when the maximum line length is exceeded.
- Allows mixing graphics, regular and double width characters on the same line.
- Up to 50 characters per second.
- Standard Centronics type Parallel interface.
- Self-test mode.
- Optional RS-232-C Serial Interface.

PRINTERS GALORE AT UNBEATABLE PRICES

MICRO-80 has a range of printers to suit every requirement from dot-matrix to correspondence quality daisywheel. Choose from the table below:

BRAND	MODEL	TYPE	SPECIFICATIONS									
			COL	SPEED CPS	BI-DIR	LOWER CASE	PAPER FEED	GRAPHICS	INTER FACES	FREIGHT	PRICE	WEEKLY PAY-MENTS*
EPSON	MX-80III	DM	80	80	Y	FULL	F/T	HI-RES	P	1	$ 999	$ 8.35
EPSON	MX-100III	DM	132	100	Y	FULL	F/T	HI-RES	P	1	$1500	$12.55
MICROLINE	83A	DM	132	120	Y	FULL	F/T	BLOCK	P/S	1	$1599	$13.37
MICROLINE	84	DM	132	200	Y	FULL	F/T	HI-RES	P	1	$2220	$18.57
MICROLINE	84	DM	132	200	Y	FULL	F/T	HI-RES	S	1	$2340	$19.57
C ITOH	8510	DM	80	112	Y	FULL	F/T	HI-RES	P	1	$ 999	$ 9.19
C ITOH	M1550	DM	132	120	Y	FULL	F/T	HI-RES	P	1	$1499	$12.54
OLIVETTI	PRAXIS35	DW	100	6	N	FULL	F	NO	P	1	$ 895	$ 8.33
OLIVETTI	ET121	DW	132	12	N	FULL	F	NO	P	2	$1500	$12.55
OLIVETTI	ET221	DW	132	16	N	FULL	F	NO	P	2	$2650	$22.17
ITOH	F10 40P	DW	132	40	Y	FULL	F	NO	P	2	$1950	$16.31
ITOH	F10 40S	DW	132	40	Y	FULL	F	NO	S	2	$2190	$18.32

NOTE: The following symbols are used:

TYPE +	DM = DOT MATRIX DW = DAISYWHEEL
BI DIRECTIONAL	Y = YES N = NO
LOWER CASE	FULL — means Lowercase descenders to below line
PAPER FEED	F — means Friction Feed T — means Tractor Feed F/T — means both Friction and Tractor Feed included in price
INTERFACES	P = PARALLEL (Centronics) S = SERIAL (RS232)
FREIGHT	1 — Add $10 for road freight anywhere in Australia 2 — Add $20 for road freight anywhere in Australia

MICRO 80 PRODUCTS

Note: Prices subject to change without notice. Prices quoted include Sales Tax at the 17.5% rate. Call or write for more details.

the Form Feed character (0CH) through the printer driver). Both of these lines may need to be changed depending on your computer and printer. In the double-strike mode the routine at 440 does not slow the process down, but in normal mode the printer waits for a time as each new line is constructed. The alternative would be to produce the calendar in a string array, which would use much more string space and need more memory than the 4K used by this method.

- 0000000000 -

***** EXTENDING THE BASIC INTERPRETER: HEX CONSTANTS by Roger Bowler *****

As a Level II user, you may occasionally have grown tired of converting hex RAM addresses to decimal before you can use them in BASIC; or you may find programs difficult to understand because they refer to RAM addresses in decimal. Maybe you have even looked enviously at the Disk Basic manual and wished you could write statements such as:

```
FOR I=&H3C40 TO &H3CBF: POKE I,&H86:NEXT
```

Well, in the world of software nothing is impossible, and after running this short program, you will be able to write and run programs containing hex constants as in the above example. First power up the 80 with a MEMORY SIZE of 20416 (4K RAM) or 32704 (16K RAM), then CLOAD and RUN this program. All the program does is to POKE some machine code into the 60 bytes of RAM immediately above the MEMORY SIZE limit, then it executes a couple of sample statements containing hex constants, just to demonstrate that the machine code works. Now you no longer need to keep the BASIC program resident, so you can type NEW and your '80 will quite happily accept programs with hex constants in them. Incidentally, if you are typing this program in from a listing, you would be well advised to CSAVE it before running it. Of course, this program will have to be CLOADed and RUN again every time you power on.

Now how does it work? We are fortunate that the BASIC interpreter used by the '80 was designed to allow extensions such as this. There are about 2 dozen strategically located points during interpretation where the ROM code will jump out into the RAM to see whether the user wishes to do any additional processing. This is called an "exit" from the ROM, and in a normal cassette system all these exits are unused. The exit we are using is taken by the interpreter whenever it finds an expression in your program which starts with a "&"; it consists of a call out to RAM location 4162H. Now unless you have Disk Basic loaded, location 4152H contains a jump back into the ROM to a piece of code which prints the "L3 ERROR" message. What we have done is to replace this jump by a jump to our own machine code in high RAM; our code will function as an extension of the BASIC interpreter by packing the hex characters following &H into their binary equivalent, and passing the result back to the ROM.

When we come in to our code, the ROM gives us the address of the "&" character in the HL register pair. In return for this generosity, we have to update the HL register pair to point past the hex characters, and we store the result (i.e. their packed value) as a 16 bit integer with LSB at location 4121H and MSB at 4122H. We also have to set location 40AFH equal to 02 to tell the ROM that the value we're sending him back is an integer (as opposed to single precision or string etc.). Then we can do a simple RET to continue interpretation.

So now you can run programs with &H constants in them, and what's more, the syntax is compatible with Disk Basic!

Although the BASIC program shows the machine code being stored in high memory, this is only an example, since the machine code is completely relocatable. This means it doesn't contain any references to addresses within itself; all jumps are relative using the "JR" or "DJNZ" instructions. So you may well prefer to save the machine code somewhere else in RAM, to avoid having to protect high memory. One way of doing this is to shift the "start of basic" pointer at 40A4 to point to 4325 instead of 42E9. This is done by:

```
POKE 16548,37:POKE 16549,67:NEW
```

(The NEW forces BASIC to recompute its pointers to account for the new start address). Ignore the SN ERROR. Now you have freed up locations 17129-17188 (42E9-4324) into which you can store the machine code. Happy hexing!

I always build USR routines using dynamic string packing. This technique (described in Appendix H of the Level II Basic manual) involves packing the machine code into a string variable from DATA statements during program initialisation. It has a number of drawbacks, not the least of which being that it is rather S-L-O-W. But these I can live with. What I do draw the line at is writing machine code in DECIMAL; that is something I cannot do! Hasn't this crazy computer heard of HEX?

Well, mine has; I write my machine code like this:

```
200 DATA CD7F0A,5E23,56,EB,C39A0A,*
```

and I include a little basic subroutine at the end of each program to pack these DATA statements into strings.

The subroutine reads each "instruction" from the data as a string, then decodes and packs each pair of hex digits into a byte which it appends to string P$. The subroutine continues to build up the string until it reads an asterisk. Then by means of a quick

```
POKE 16526,PEEK(VARPTR(P$+1)=POKE 16527,PEEK(VARPTR(P$)+2)
```

we are all ready to do a USR call.

It is quite easy to set up several independent USR routines in this way; I just make sure each set of DATA statements ends with an asterisk, and save the routine in another string variable before calling the hex pack subroutine again.

One thing to watch when using dynamic string packing - BASIC tends to move strings around in RAM (to reclaim unused string space), so set the VARPTRs immediately before making the USR call.

- 0000000000 -

***** SERIES IMPEDANCE CALCULATIONS L2/16K - by W.G. Heath *****

This program illustrates one of the fundamental formulae connected with electrical problems and may be of interest to electrical engineering students and amateur radio enthusiasts.

As explained on the first two displays on the video screen, a wide variety of problems are solvable and not confined to the general form of series resistance, inductance and capacitance alone. Some of these elements need not be present but the program is still adaptable, it will also operate the OHM's law solutions of current, resistance and voltage (I=E/R)

Following an indication of the scope of the program, a display list of all the variables involved is shown. Then follows the request for input of known and unknown values related to the problem in question.

The calculations are then made and the individual variables are displayed together with their measured or calculated values.

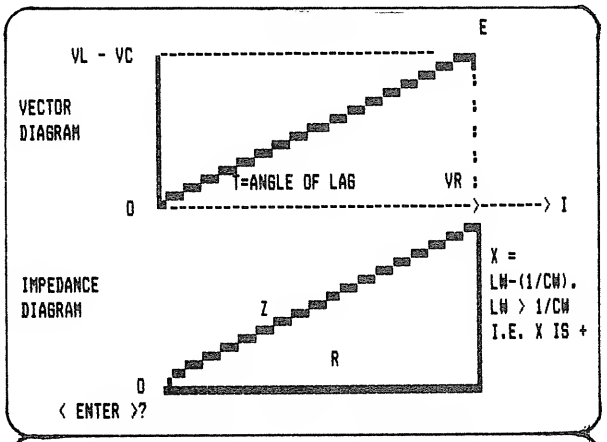
A graphical display of the general series circuit only, follows, plus an outline of the various vector relationships and the impedance diagram.

- 0000000000 -

Shown below are views of the screen:

```
>>> SERIES IMPEDANCE CIRCUIT <<<

        A WIDE VARIETY OF ELECTRICAL CIRCUIT PROBLEMS OF THIS
CATEGORY ARE SOLVEABLE DEPENDING UPON THE KNOWN AND UNKNOWN VAR-
IABLES AVAILABLE.

        THE PROGRAMME WILL CALCULATE ALL THE VARIABLES SHOWN
IN THE FOLLOWING SCHEDULE SUBJECT TO APPROPRIATE INPUT VALUES.

        IT WILL HANDLE TWO UNKNOWNS SIMULTANEOUSLY PROVIDING
ONE UNKNOWN IS EITHER I, E, OR R, AND THE SECOND IS EITHER L, C
OR X. MAKE NO ENTRY FOR THE UNKNOWN VALUES. I.E. PRESS <ENTER>
ONLY WHEN INPUT? FOR THESE VARIABLES IS CALLED FOR.

   < ENTER >? _
```

```
        THE PROGRAMME CAN BE USED FOR PROBLEMS WHERE NO CAPAC-
ITANCE OR, ALTERNATIVELY, NO INDUCTANCE IS PRESENT.

        INDUCTANCE CAN BE CALCULATED FOR AN INDUCTIVE CIRCUIT
WITHOUT CAPACITANCE IF I, E, AND R, ARE KNOWN VALUES.

        FINALLY THE PROGRAMME WILL ALSO OPERATE A SIMPLE OHM'S
 LAW SOLUTION ( I = E/R ) BY INPUTTING 0 ( ZERO ) FOR BOTH  C
( CAPACITANCE ) AND L ( INDUCTANCE ) SIMULTANEOUSLY.

        AFTER ALL CALCULATIONS HAVE BEEN COMPLETED A FURTHER
TWO SCROLLS OF THE SCREEN CAN BE MADE WHICH WILL DISPLAY A CIR-
CUIT DIAGRAM OF THE GENERAL SERIES CIRCUIT FOLLOWED BY A VECTOR
DIAGRAM AND IMPEDANCE DIAGRAM
   < ENTER >?
```




```
>>> REVIEW OF VALUES OF ALL VARIABLES <<<

CURRENT          I = 14.1421      INDUCTANCE      L = .0487177
VOLTAGE          E = 200          FREQUENCY       F = 50
RESISTANCE       R = 10           CAPACITANCE     C = 6E-04
EQUIV REACT      X = 10           IMPEDANCE       Z = 14.1421
PHASE ANGLE      T = 45           POWER FACTOR    Q = .707107
IND. REACT.      G = 15.3052      IND.VOLT DROP VL = 216.448
CAP. REACT.      J = 5.30515      CAP.VOLT DROP VC = 75.0262
R.VOLT DROP     VR = 141.421      RESONANT FREQ.  H = 29.4374
POWER (WATTS)    P = 2000


                -- ALL CALCULATIONS COMPLETED --
READY
>
```

***** DR. WHO ADVENTURE LII/16K or 32K/Disk *****

This adventure will just run in a Level 2 16K machine provided the following instructions are followed. It will run also with Disk BASIC (with at least 32K of memory).

For the disk version, lines 720 and 730 are replaced by the two lines listed separately, the program supplied on the distribution disk has already been converted for you.

This is an unusual adventure, using a data file in a manner similar to the Epyx games. The data file is the file called DRWHO/DAT on the distribution disk. This was created using the initialization program listed. If you are entering this program from the magazine you will have to run this program to create a data file either on disk or cassette.

The program uses a full 16K which is why it needs the data file.

For a cassette based system, use the following procedure:

(1) Type in the initializer, check it, and SAVE it to tape.

(2) Type in the adventure, check it, and SAVE it to tape (a different one...leave this positioned to just after the program).

(3) Reload the initializer and swap back to the tape the adventure is on (it should be positioned just after the program).

(4) Run the initializer and answer the question with T for tape.

(5) Rewind the tape, reload the adventure, and run it.

(6) Disk users type in both programs and SAVE them to disk. Add the lines provided to make the cassette version work on disks. Run the initializer and answer D. Then run the adventure.

NOTE: People with more than 16K and disk users may find it advantageous to merge the data in the initializer with the main program. Although no explanation of how to do this is given here, it should not be too difficult.

INSTRUCTIONS.

After Dr. Who collected the Key to Time and defeated the Black Guardian, he received many praises and went on to greater things. The Key itself was again broken into its component pieces and scattered throughout the universe.

But the dark forces threaten, and in order to save the universe, the Timelords again need the Key. You have been chosen to go forth and locate it for them. You will be given a TARDIS (rather old and unreliable, but the best available) that has the coordinates of the planets on which the six parts are located pre-programmed into it. By RESETing its controls you can travel between the six planets and Galafry. As usual, the six parts are disguised as other things, and you will have to use your intuition to figure out which is which. (There is a way to tell...)

All the planets are inhabited, and most inhabitants tend to be antisocial. Whether you TALK to them, HIDE from them, kill them, OFFER them gifts of appeasement, or simply ignore them is up to you. Most objects are obvious, but some are hidden and have to be SEARCHed for. Only one key part is on any one planet. Beware the maze on Peladon...

You can use commands of up to 64 characters. The program will ignore any words it doesn't understand. Commands can be one, two or three words long.

When you find all the parts (or think you have), take them back to the throne room on Galafry to win.

The program only needs to read in data once. You will only need to rewind the data tape if you type BREAK or answer no to the "Another game?" question.

- 0000000000 -

***** LOWER CASE CONVERTER FOR BASIC PROGRAMS by D.M. Wright *****

After you have fitted a lower case conversion kit to your TRS-80/System 80 and have a Driver routine operating to your satisfaction, you will no doubt look back at all those BASIC programs you have produced with only capital letters displayed. While many programs have only a few statements in the way of instructions to modify, the thought of virtually retyping some of the long Adventure type programs is most daunting.

The following Assembly language program goes a long way to solving the problem as it converts the characters inside PRINT statements into lower case with the exceptions of the first letter in the quotation and the first letter after a period and two spaces which is assumed to be a new sentence. It only alters characters within the PRINT statement and does not convert program commands and statements.

It will be necessary to finally edit the program to capitalise people's names or titles which occur in PRINT statemments such as ..... system 80/trs-80 ... or ... commander smith ...

Conditional statements may also need editing as follows:

IF A$ = "Yes" THEN 100 would need to be altered back to,
IF A$ = "YES" THEN 100 or perhaps better still,
IF A$ = "YES" OR A$ = "yes" THEN 100

So with a little care in final editing you too can have small letters in abundance throughout your programs and across your screen.

The program can be assembled with an Editor/Assembler and can be relocated by altering the ORG in line 140 of the source listing to ØBE1ØH for a 32K system or to ØFE1ØH for a 48K system. Alternatively, the HEX dump (for 16k system) that follows the source listing can be entered with a low memory monitor.

For this program to work you must have lowercase installed in your machine and a lower case driver active.

To load from tape:

1. Answer MEMORY SIZE? (READY?) with: 32272.
2. Load the machine language using SYSTEM.
3. Type: /32272 (ENTER/NEWLINE) to start.

To load from distribution disk:

1. BASIC, 65040 (ENTER/NEWLINE)
2. CMD "CONVERT"
3. Type: /65040 (ENTER/NEWLINE) to start.

The program will initialize and display a copyright message. Then load the BASIC program you want converted and when ready, type:

SYSTEM (ENTER/NEWLINE)
/32272 (ENTER/NEWLINE)

You can use the converter as many times as you like. The CMD file and EDTASM file supplied on the distribution DOS are for a 48k system. For a 32k system and suitably assembled machine language program, use 48656 as the memory size and entry address.

- 0000000000 -

```
                    00010 ;
                    00020 ;       LOWER CASE CONVERTOR  VER 2.0
                    00030 ;
                    00040 ;       CREATED          17 JUNE  1982
                    00050 ;       BY               DENNIS WRIGHT
                    00060 ;       1  SNEAD COURT  DINGLEY  3172
                    00070 ;       (C)        ALL RIGHTS RESERVED
                    00080 ;
40A4                00090 BASBEG  EQU     40A4H
40F9                00100 BASEND  EQU     40F9H
06CC                00110 BASIC   EQU     06CCH
4020                00120 CURSOR  EQU     4020H
                    00130 ;
7E10                00140         ORG     7E10H
7E10 CDC901         00150 INIT    CALL    01C9H
7E13 21BC7E         00160         LD      HL,MESG1        ;PRINT MAIN MESSAGE
7E16 11403C         00170         LD      DE,3C40H
7E19 018000         00180         LD      BC,80H
7E1C EDB0           00190         LDIR
7E1E 213C7F         00200         LD      HL,MESG2
7E21 11003D         00210         LD      DE,3D00H
7E24 014000         00220         LD      BC,40H
7E27 EDB0           00230         LDIR
7E29 21803D         00240         LD      HL,3D80H        ;PLACE CURSOR
7E2C 222040         00250         LD      (CURSOR),HL     ;BELOW MESSAGE
7E2F ED5BA440       00260         LD      DE,(BASBEG)
7E33 2AF940         00270         LD      HL,(BASEND)
7E36 B7             00280         OR      A               ;CLEAR FLAGS
7E37 ED52           00290         SBC     HL,DE           ;FIND PROGRAM LENGTH
7E39 7D             00300         LD      A,L             ;ROUTINE CHECKS
7E3A FE02           00310         CP      2               ;IF PROGRAM LENGTH
7E3C 2005           00320         JR      NZ,CONT         ;IS ONLY TWO BYTES
```

```
7E3E 7C       00330          LD      A,H             ;LONG WHICH
7E3F FE00     00340          CP      0               ;INDICATES
7E41 285D     00350          JR      Z,NOPROG        ;NO BASIC PROGRAM LOADED
7E43 EB       00360 CONT     EX      DE,HL           ;PUT PROGRAM START ADDRESS
7E44 23       00370          INC     HL              ;INTO HL AND
7E45 23       00380          INC     HL              ;JUMP LINE
7E46 23       00390          INC     HL              ;POINTERS
7E47 CD997E   00400 SEARCH   CALL    NXTBYT          ;GET NEXT BYTE
7E4A FE22     00410          CP      22H             ;QUOTE?
7E4C 20F9     00420          JR      NZ,SEARCH       ;TRY AGAIN
7E4E CD997E   00430 FSTCAP   CALL    NXTBYT          ;ROUTINE LEAVES 1ST LETTER U
/C
7E51 FE22     00440          CP      22H             ;2ND QUOTE?
7E53 28F2     00450          JR      Z,SEARCH        ;SEARCH FOR NEXT QUOTATION
7E55 FE41     00460          CP      41H             ;LESS THAN "A"?
7E57 38F5     00470          JR      C,FSTCAP        ;SEARCH FOR 1ST CAPITAL
7E59 FE5B     00480          CP      5BH             ;GREATER THAN "Z"?
7E5B 30F1     00490          JR      NC,FSTCAP       ;SEARCH FOR 1ST CAPITAL
7E5D CD997E   00500 FNDLET   CALL    NXTBYT
7E60 FE22     00510          CP      22H             ;2ND QUOTE?
7E62 28E3     00520          JR      Z,SEARCH        ;SEARCH FOR NEXT QUOTATION
7E64 FE2E     00530          CP      2EH             ;PERIOD?
7E66 280D     00540          JR      Z,NUSENT        ;CHECK FOR NEW SENTENCE
7E68 FE41     00550 CONVRT   CP      41H             ;LESS THAN "A"?
7E6A 38F1     00560          JR      C,FNDLET        ;FIND LETTER
7E6C FE5B     00570          CP      5BH             ;GREATER THAN "Z"?
7E6E 30ED     00580          JR      NC,FNDLET       ;FIND LETTER
7E70 C620     00590          ADD     A,20H           ;CONVRT TO LOWERCASE
7E72 77       00600          LD      (HL),A          ;STORE BACK IN PROGRAM
7E73 18E8     00610          JR      FNDLET
7E75 CD997E   00620 NUSENT   CALL    NXTBYT
7E78 FE22     00630          CP      22H             ;2ND QUOTE?
7E7A 28CB     00640          JR      Z,SEARCH        ;SEARCH FOR NEXT QUOTATION
7E7C FE20     00650          CP      20H             ;SPACE?
7E7E 20E8     00660          JR      NZ,CONVRT       ;THEN CONVERT
7E80 CD997E   00670          CALL    NXTBYT
7E83 FE22     00680          CP      22H             ;2ND QUOTE?
7E85 28C0     00690          JR      Z,SEARCH        ;SEARCH FOR NEXT QUOTATION
7E87 FE20     00700          CP      20H             ;2ND SPACE?
7E89 20DD     00710          JR      NZ,CONVRT       ;THEN CONVERT
7E8B 18C1     00720          JR      FSTCAP          ;SEARCH FOR FIRST CAPITAL
7E8D C1       00730 LINEND   POP     BC              ;CLEAR STACK
7E8E 23       00740          INC     HL              ;JUMP OVER
7E8F 23       00750          INC     HL              ;LINE POINTER
7E90 7E       00760          LD      A,(HL)          ;CHECK FOR
7E91 FE00     00770          CP      0               ;END OF PROGRAM
7E93 2819     00780          JR      Z,PROEND        ;RET TO BASIC
7E95 23       00790          INC     HL              ;JUMP OVER
7E96 23       00800          INC     HL              ;LINE NUMBER
7E97 18AE     00810          JR      SEARCH          ;LOOK IN NEXT LINE
7E99 23       00820 NXTBYT   INC     HL
7E9A 7E       00830          LD      A,(HL)          ;LOAD NEXT BYTE
7E9B FE00     00840          CP      0               ;END OF PROGRAM LINE?
7E9D 28EE     00850          JR      Z,LINEND        ;GO JUMP LINE POINTERS
7E9F C9       00860          RET
7EA0 217C7F   00870 NOPROG   LD      HL,MESG3        ;PRINT 'NO PROGRAM' MESSAGE
7EA3 11003D   00880          LD      DE,3D00H
7EA6 014000   00890          LD      BC,40H
7EA9 EDB0     00900          LDIR
7EAB C3CC06   00910          JP      BASIC           ;RETURN TO BASIC
7EAE 21BC7F   00920 PROEND   LD      HL,MESG4        ;PRINT 'COMPLETED' MESSAGE
7EB1 11003D   00930          LD      DE,3D00H
7EB4 014000   00940          LD      BC,40H
7EB7 EDB0     00950          LDIR
7EB9 C3CC06   00960          JP      BASIC           ;RETURN TO BASIC
7EBC 20       00970 MESG1    DEFM    '       LOWER CASE CONVERTER FOR BASIC PROGR
AMS   VERSION 2.0    '
7EFC 20       00980          DEFM    '       CREATED BY DENNIS WRIGHT          (
C)    17 JUNE 1982   '
7F3C 20       00990 MESG2    DEFM    '       PROGRAM  CONVERTING RESIDENT BASIC P
ROGRAM               '
7F7C 20       01000 MESG3    DEFM    '                    NO BASIC PROGRAM LOADE
D                    '
7FBC 20       01010 MESG4    DEFM    '                       CONVERSION COMPLETE
                     '
7E10          01020          END     INIT
```

```
7E10:  CD C9 01 21 BC 7E 11 40 3C 01 80 00 ED B0 21 3C
7E20:  7F 11 00 3D 01 40 00 ED B0 21 80 3D 22 20 40 ED
7E30:  5B A4 40 2A F9 40 B7 ED 52 7D FE 02 20 05 7C FE
7E40:  00 28 5D EB 23 23 23 CD 99 7E FE 22 20 F9 CD 99
7E50:  7E FE 22 28 F2 FE 41 38 F5 FE 5B 30 F1 CD 99 7E
7E60:  FE 22 28 E3 FE 2E 28 0D FE 41 38 F1 FE 5B 30 ED
7E70:  C6 20 77 18 E8 CD 99 7E FE 22 28 CB FE 20 20 E8
7E80:  CD 99 7E FE 22 28 C0 FE 20 20 DD 18 C1 C1 23 23
7E90:  7E FE 00 28 19 23 23 18 AE 23 7E FE 00 28 EE C9
7EA0:  21 7C 7F 11 00 3D 01 40 00 ED B0 C3 CC 06 21 BC
7EB0:  7F 11 00 3D 01 40 00 ED B0 C3 CC 06 20 20 20 20
7EC0:  20 20 20 4C 4F 57 45 52 20 43 41 53 45 20 43 4F
7ED0:  4E 56 45 52 54 45 52 20 46 4F 52 20 42 41 53 49
7EE0:  43 20 50 52 4F 47 52 41 4D 53 20 20 20 56 45 52
7EF0:  53 49 4F 4E 20 32 2E 30 20 20 20 20 20 20 20 20
7F00:  20 20 20 43 52 45 41 54 45 44 20 42 59 20 44 45
7F10:  4E 4E 49 53 20 57 52 49 47 48 54 20 20 20 20 20
7F20:  20 20 20 20 20 20 28 43 29 20 20 20 31 37 20 4A
7F30:  55 4E 45 20 31 39 38 32 20 20 20 20 20 20 20 20
7F40:  20 20 20 50 52 4F 47 52 41 4D 20 20 43 4F 4E 56
7F50:  45 52 54 49 4E 47 20 52 45 53 49 44 45 4E 54 20
7F60:  42 41 53 49 43 20 50 52 4F 47 52 41 4D 20 20 20
7F70:  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
7F80:  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
7F90:  20 4E 4F 20 42 41 53 49 43 20 50 52 4F 47 52 41
7FA0:  4D 20 4C 4F 41 44 45 44 20 20 20 20 20 20 20 20
7FB0:  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
7FC0:  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
7FD0:  20 20 20 20 43 4F 4E 56 45 52 53 49 4F 4E 20 43
7FE0:  4F 4D 50 4C 45 54 45 20 20 20 20 20 20 20 20 20
7FF0:  20 20 20 20 20 20 20 20 20 20 20 20
```

****** VARIABLE WORKSHEET ******

COLOUR COMPUTER

```
10 '***VARIABLE WORKSHEET***
20 '*****FOR THE TRS8CC*****
30 'ORIGINALLY BY S&P MILLER
40 'FOR THE TRS80
50 CLEAR 1000
60 CLS
70 PRINT @ 71,"VARIABLE WORKSHEE
T "
80 PRINT TAB(15)"BY
90 PRINT"BY S & P MILLER FOR THE
 TRS80CC
100 PRINT
110 PRINT
120 INPUT"MAX. NUMBER OF ARRAYS"
;A
130 INPUT"MAX. NUMBER OF SUBROUT
INE LINES REQUIRED";B
140 INPUT"MAX. NUMBER OF VARIABL
E LINES   REQUIRED";C
150 INPUT"NUMBER OF COPIES REQUI
RED  ";Y
160 FOR J=1 TO Y
170 PRINT#-2, CHR$(27)CHR$(14)"V
ARIABLE WORKSHEET"
180 PRINT#-2,"PROGRAM : ",,"PROG
RAMMER :",,"DATE :  /  /19  :"
190 PRINT#-2," "
200 PRINT#-2,"MEMORY CLEARED -
          MEMORY PROTECTION AT -
"
210 PRINT#-2," "
220 PRINT#-2," "
230 PRINT#-2," "
240 PRINT#-2,"LIST OF DIMENSIONE
D ARRAYS :-"
250 FOR X=1 TO A
260 PRINT#-2," DIM   (   )   : N
AME :"
270 NEXT X
280 PRINT#-2," "
290 PRINT#-2,"SUBROUTINE INFORMA
TION :-"
300 PRINT#-2," "
310 PRINT#-2," START #:  END # :
 COMMENTS "
320 PRINT#-2," "
330 FOR X=1 TO B
340 PRINT#-2," ------ ";":";" --
---- ";": ";
350 PRINT#-2, STRING$(41,"-")
360 NEXT X
370 PRINT#-2," "
380 PRINT#-2,"VARIABLE LIST :-"
390 PRINT#-2," "
400 PRINT#-2," NAME
   LABEL/USE
410 PRINT#-2," "
420 FOR X=1 TO C
430 PRINT#-2,"  ---",
440 PRINT#-2, STRING$(44,"-")
450 NEXT X
460 PRINT#-2," "
470 PRINT#-2,"PERIPHERALS REQUIR
ED :-"
480 PRINT#-2," "
490 PRINT#-2," CASSETTE ( ) :PRI
NTER ( ) :DISKS ( ) NUMBER REQUI
RED -- "
500 PRINT#-2,"NOTES:- "
510 PRINT#-2," "
520 PRINT#-2," "
530 PRINT#-2," "
540 NEXT J
550 CLEAR 50
560 '   VARIABLE LIST:-
570 ' A: NO. OF ARRAY LINES
580 ' B: NO. OF SUBROUTINE LINES
590 ' C: NO. OF VARIABLE LINES
600 ' Y: NO. OF COPIES REQUIRED
610 ' J: LOOP COUNTER FOR COPIES
620 ' X: LOOP COUNTER FOR A,B,C
```

```
  **** MILEAGE CALCULATOR ****

        COLOUR COMPUTER


10 '***MILEAGE CALCULATOR***
20 '****FOR THE TRS80CC*****
30 'ORIGINALLY BY FRANK GRECO
40 'FOR THE TRS80
50 '
60 'DISK USERS CHANGE :-
70 '#-1 TO #1 IN LINES 540-560,
80 'ADD :- '+STR$(M)' TO 540,
'+STR$(MM) TO 1010, '+STR$(M+1)'
 TO 1170
90 'LEAVE OUT THE 'AUDIO ON'S
100 'CHANGE 'TAPE'S TO 'DISK'S
110 '
120 '
130 CLS:PRINT@65,"KMS PER LITRE/
MILES PER GALLON            CONVE
RSION."
140 PRINT" WRITTEN BY FRANK GREC
O."
150 PRINT" MARIBYRNONG VICTORIA,
AUSTRALIA
160 FORX=1 TO 3000:NEXTX
170 GOTO 680
180 SOUND200,1
190 CLS:PRINT:INPUT"MONTH NUMBER
 (1 TO 12)";M
200 IF M<1 OR M>12 THEN 190
210 INPUT"KILOMETERS AT THE STAR
T";A
220 INPUT"KILOMETERS AT THE END"
;B
230 INPUT"HOW MANY LITRES HAVE Y
OU PUT IN THE TANK";F
240 INPUT"COST";CC
250 C=B-A
260 PRINT:PRINT
270  PRINT"YOU TRAVELLED";C;"KIL
OMETERS."
280  REM* CONV KM TO MILES *
290 D=C*0.62
300 PRINT"THAT'S ABOUT ";INT(D);
" MILES."
310 PRINT:PRINT"NOW I AM WORKING
 OUT YOUR PETROL CONSUMPTION."
320 SOUND200,1
330 FORX=1 TO 1000:NEXTX
340 CLS
350  REM** PETROL CONS **
360 E=C/F
370 G=E*0.62
380 H=G*4.5
390 REM * LITRES PER 100 KM *
400 FF=F/(C/100)
410 PRINT"DISTANCE TRAVELLED IS"
;C;"KMS."
420 PRINT"WHICH IS ABOUT";INT(D)
;"MILES."
430 PRINT:PRINT"PETROL CONS FOR"
;C;"KMS IS ";:PRINT USING "##.#"
;E;:PRINT" KMS/LITRE."
440 PRINT:PRINT"-ABOUT"INT(H)"MI
LES PER GALLON."
450 PRINT:PRINT"THAT IS ";:PRINT
 USING "##.#";FF;:PRINT" LITRES
PER 100 KM."
460 PRINT:PRINT"WANT TO SAVE IT
ON TAPE? <Y/N> ";
470 GOSUB 600
480 CLS
490 SOUND200,1
500  PRINT@162,"MAKE PREPARATION
S FOR DUMPING"
510 PRINT@290,"";:INPUT"HIT ENTE
R WHEN READY";A
520 CLS:PRINT@266,"DUMPING DATA"
530 AUDIOON
540 OPEN "O",#-1,"MILES"
550 PRINT#-1,M,CC,A,B,F,D,E,H,C,
FF
560 CLOSE #-1
570 CLS:PRINT@226," MAKE ANOTHER
 COPY ? <Y/N> ";
580 GOSUB 600
590 GOTO520
600 SOUND200,1
610 C$=INKEY$:IF C$=""THEN610
620 IF C$="Y" THEN RETURN ELSE I
F C$="N" THEN CLS
630  CLS: PRINT:PRINT"  ANY MORE
 DATA? <Y/N> ";
640 SOUND200,1
650 G$="":G$= INKEY$:IF G$="" TH
EN 650
660 IF G$="Y" THEN 190
670 IF G$="N" THEN CLS:GOTO 680

680 CLS:PRINT@44,"M E N U "
690 PRINT:PRINT
700 PRINT"  1 - INPUT DATA ROUTI
NE"
710 PRINT"  2 - PROJECTION  CHAR
T"
720 PRINT"  3 - SUMMARY
730 PRINT"  4 - END"
740 SOUND200,1
750 A$="":A$= INKEY$:IF A$="" TH
EN 750
760 B= VAL(A$):ON B GOTO 190   ,
770  ,880  ,1350
770 CLS:PRINT@40,"PROJECTION CHA
RT"
780 PRINT:PRINT"ON THE AVERAGE H
OW MANY KM/LITRE DOES YOUR CAR D
O ";
790 INPUT P
800 PRINT:PRINT"HOW MANY KM DO Y
OU WANT IT       PROJECTED  FOR
";
810 INPUT PP
820 XX=PP/P
830 PRINT:PRINT"ON";PP;"KM YOU W
OULD NEED"INT(XX)"LITRES OF FUEL
"
840 PRINT:PRINT:PRINT"PRESS ANY
KEY TO RETURN TO MENU"
850 SOUND200,1
860 D$= INKEY$:IF D$="" THEN 860
  ELSE 870
870 GOTO 680
880 CLS:PRINT@44,"SUMMARY"
890 PRINT:PRINT:PRINT
900  PRINT"  MONTHLY OR YEARLY (
M OR Y) ?"
910 SOUND200,1
920 E$="":E$= INKEY$:IF E$="" TH
EN 920
930 IF E$="M"THEN950  ELSE1100
940 STOP
950  CLS:PRINT@44,"MONTHLY"
960 SOUND200,1
970 PRINT:PRINT:PRINT:INPUT" MON
TH NUMBER = ";MM
980 M=0
990 CLS:PRINT@230,"READING -- MO
NTH";M+1
1000 AUDIO ON
1010 -1030, 1170-1190
1020 INPUT #-1,M,CC,A,B,F,D,E,H,
C,FF
1030 CLOSE #-1
1040 IF M<>MM THEN 990
1050 CLS:PRINT@40,"MONTH NUMBER"
;M:PRINT:PRINT
1060  GOSUB1360
1070 CLS:PRINT@470,"--- ANY MORE
 MONTHS ? <Y/N> ---"
```

```
1080  GOSUB 600
1090 -1030, 1170-1190
1100 PRINT:PRINT
1110 SOUND200,1
1120 INPUT"PRESS ENTER WHEN TAPE
 READY";A
1130 CLS:PRINT@102,"READING -- Y
EARLY
1140 M=0
1150 PRINT@234,"MONTH #";M+1
1160 AUDIO ON
1170 OPEN"I",#-1,"MILES"
1180 INPUT #-1,M,CC,A,B,F,D,E,H,
C,FF
1190 CLOSE #-1
1200 Z=Z+CC
1210 Y=Y+F
1220 QQ=QQ+C
1230 RR=RR+E
1240 IF M<12 THEN 1150
1250 CLS:PRINT@44,"COSTS"
1260 PRINT:PRINT
1270  PRINT"TOTAL LITRES","TOTAL
 COST"
1280 PRINTY,Z
1290 PRINT:PRINT:PRINT"TOTAL KMS
","AVG KM/L"
1300 R=RR/12
1310 PRINTQQ,:PRINT USING"##.##"
;R
1320 PRINT:PRINT:PRINT:PRINT"PRE
SS ANY KEY TO RETURN TO MENU"
1330 GOSUB 650
1340 RETURN
1350  CLS:PRINT@200,"--- THE END
 ---":PRINT@447," ";:END
1360  PRINT"TOTAL LITRES","TOTAL
 COST"
1370 PRINT:PRINTF,CC
1380 PRINT:PRINT:PRINT"TOTAL KMS
","AVG KM/L"
1390 PRINT:PRINTC,:PRINT USING"#
#.##";E
1400 PRINT:PRINT:PRINT"PRESS ANY
 KEY TO RETURN TO MENU";
1410 GOTO650
```

****** VARIABLE WORKSHEET ******

HITACHI PEACH

```
2 '  ************************************
****
3 '  * VARIABLE WORKSHEET - FOR THE TRS-
80 *
4 '  *    S & P MILLER    : P.O.BOX 37-1
30 *
5 '  *    STOKES VALLEY   ; NEW ZEALAND
   *
6 '  ************************************
****
10 CLEAR 1000
20 CLS
30 LOCATE13,4:PRINT"VARIABLE WORKSHEET "
35 PRINT
40 PRINT TAB(38)"BY S & P MILLER - FOR T
HE TRS-80"
50 PRINT
60 PRINT TAB(38)"  - MODIFIED FOR HITACH
I MB-6890"
65 PRINT
70 PRINT
80 INPUT"ENTER MAX. NUMBER OF ARRAYS  ";
A
90 INPUT"ENTER MAX. NUMBER OF SUBROUTINE
 LINES REQUIRED  ";B
100 INPUT"ENTER MAX. NUMBER OF VARIABLE
LINES REQUIRED  ";C
110 INPUT"ENTER NUMBER OF COPIES REQUIRE
D  ";Y
115 OPEN"O",1,"LPT0:"
120 FOR J=1 TO Y
130 PRINT#1,"VARIABLE WORKSHEET"
140 PRINT#1,"PROGRAM : ",,"PROGRAMMER :"
,,"DATE :  /  /19  :"
150 PRINT#1," "
160 PRINT#1,"MEMORY CLEARED -
MEMORY PROTECTION AT - "
170 PRINT#1," "
180 PRINT#1,"LIST OF TYPE DEFINITIONS :-
"
190 PRINT#1," "
200 PRINT#1," DEFSTR --- "
210 PRINT#1," DEFINT --- "
220 PRINT#1," DEFSNG --- "
230 PRINT#1," DEFDBL --- "
240 PRINT#1," "
250 PRINT#1," "
260 PRINT#1,"LIST OF DIMENSIONED ARRAYS
:-"
270 FOR X=1 TO A
280 PRINT#1," DIM   (   )   : NAME :"
290 NEXT X
300 PRINT#1," "
310 PRINT#1,"SUBROUTINE INFORMATION :-"
320 PRINT#1," "
330 PRINT#1," START #:  END # : COMMENTS
 "
340 PRINT#1," "
350 FOR X=1 TO B
360 PRINT#1," ------ ";":";" ------ ";":
 ";
370 PRINT#1,STRING$(41,"-")
380 NEXT X
390 PRINT#1," "
400 PRINT#1,"VARIABLE LIST :-"
410 PRINT#1," "
420 PRINT#1," NAME                    LABEL/
USE"
430 PRINT#1," "
440 FOR X=1 TO C
450 PRINT#1,"  ---",
460 PRINT#1,STRING$(44,"-")
470 NEXT X
480 PRINT#1," "
490 PRINT#1,"PERIPHERALS REQUIRED :-"
500 PRINT#1," "
510 PRINT#1," CASSETTE # 1 ( ):CASSETTE
# 2 ( ):PRINTER ( ) :DISCS ( ) NUMBER RE
QUIRED -- "
520 PRINT#1,"NOTES:- "
530 PRINT#1," "
540 PRINT#1," "
550 PRINT#1," "
560 NEXT J
565 CLOSE
570 CLEAR 50
580 '      VARIABLE LIST:-
590 '    A : NUMBER OF ARRAY LINES
600 '    B :     "    "  SUBROUTINE LINES
610 '    C :     "    "  VARIABLE LINES
620 '    Y :     "    "  COPIES REQUIRED
630 '    J : LOOP COUNTER FOR COPIES
640 '    X :  "       "      "  A,B AND C
```

****** MILEAGE CALCULATOR ******

HITACHI PEACH

```
10 '          *** MILEAGE CALCULATOR ***
12 '          *       FRANK GRECO       *
13 '          *    RIVERVIEW  COURT     *
14 '          *    MARIBYRNONG VIC.     *
15 '          ************************
20 CLS:LOCATE15,10:PRINT"KILOMETERS PER
LITRE/MILES PER GALLON CONVERSION."
30 LOCATE25,12:PRINT"WRITTEN BY FRANK GR
ECO."
```

```
40 LOCATE20,14:PRINT"MARIBYRNONG VICTORI
A,AUSTRALIA,3032"
50 FORX=1 TO 3000:NEXTX
60 GOTO 500
70 CLS:INPUT"PLEASE INPUT MONTH NUMBER (
(1 TO 12))";M
80 INPUT"PLEASE INPUT KILOMETERS AT THE
START";A
90 INPUT"PLEASE INPUT KILOMETERS AT THE
END";B
100 INPUT"PLEASE INPUT HOW MANY LITRES Y
OU HAVE PUT IN THE TANK";F
110 INPUT"PLEASE INPUT COST";CC
120 C=B-A
130 PRINT:PRINT
140 PRINT"YOU HAVE TRAVELLED ";C;" KILOM
ETERS."
150 PRINT:PRINT
160 REM* CONV KM TO MILES *
170 D=C*0.62
180 PRINT"THAT'S ABOUT ";D;" MILES."
190 PRINT:PRINT"NOW I AM WORKING OUT YOU
R PETROL CONSUMPTION."
200 FORX=1 TO 1000:NEXTX
210 CLS
220 REM** PETROL CONS **
230 E=C/F
240 G=E*0.62
250 H=G*4.5
260 REM * LITRES PER 100 KM *
270 FF=F/(C/100)
280 PRINT"--- TOTAL DISTANCE TRAVELLED I
S ";C;" KMS."
290 PRINT:PRINT"--- WHICH IS ABOUT ";D;"
 MILES."
300 PRINT:PRINT"--- PETROL CONS FOR ";C;
" KMS IS ";E;" KMS/LITRE."
310 PRINT:PRINT"--- THAT'S ABOUT ";H;" M
ILES PER GALLON."
320 PRINT:PRINT"--- THAT IS ";FF;"LITRES
 PER 100 KM."
330 LOCATE19,14:PRINT"--- WANT TO SAVE I
T ON TAPE? <Y/N> --- ";
340 GOSUB 440
350 CLS
360 LOCATE25,7:PRINT"MAKE PREPARATIONS F
OR DUMPING"
370 LOCATE29,10:PRINT"";:PRINT"HIT ENTER
 WHEN READY"
375 G$="":G$=INKEY$:IF G$="" THEN 375
380 CLS:LOCATE29,10:PRINT"DUMPING DATA"
385 OPEN"O",#1,"CAS0:DATA"
390 FORX=1 TO 1000:NEXT:PRINT#1,M,CC,A,B
,F,D,E,H,C,FF
395 CLOSE
400 CLS:LOCATE29,10:PRINT"DATA HAS BEEN
DUMPED"
410 LOCATE23,12:PRINT"--- MAKE ANOTHER C
OPY <Y/N> ---";
420 GOSUB 440
430 GOTO 380
440 C$="":C$=INKEY$:IF C$="" THEN 440
450 IF C$="Y" THEN RETURN ELSE IF C$="N"
 THEN CLS
460 CLS: LOCATE25,10:PRINT"--- ANY MORE
DATA? <Y/N> ---";
470 G$="":G$=INKEY$:IF G$="" THEN 470
480 IF G$="Y" THEN 70
490 IF G$="N" THEN CLS:GOTO 500
500 CLS:LOCATE31,3:PRINT"M E N U "
510 LOCATE31,3:PRINT"SELECT 1"
520 LOCATE23,6:PRINT"1 - INPUT DATA ROUT
INE"
530 PRINTTAB(23);"2 - PROJECTION  CHART"
540 PRINTTAB(23);"3 - SUMMARY
550 PRINTTAB(23);"4 - END"
560 A$="":A$=INKEY$:IF A$="" THEN 560
570 B=VAL(A$):ON B GOTO 70   ,580  ,680
 ,1070
580 CLS:LOCATE31,3:PRINT"PROJECTION CHAR
T"
590 PRINT:PRINT"ON THE AVERAGE HOW MANY
KM/LITRE DOES YOUR CAR DO  ";
600 INPUT P
610 PRINT"HOW MANY KM DO YOU WANT IT PRO
JECTED  FOR  ";
620 INPUT PP
630 XX=PP/P
640 PRINT:PRINT"ON ";PP;"KM YOU WOULD NE
ED ";XX;" LITRES OF FUEL"
650 LOCATE17,17:PRINT" PRESS ANY KEY TO
RETURN TO MENU"
660 D$=INKEY$:IF D$="" THEN 660  ELSE 67
0
670 GOTO 500
680 CLS:LOCATE31,3:PRINT"SUMMARY"
690 PRINT:PRINTTAB(6)"READS PRERECORDED
DATA TAPE CREATED BY INPUT DATA ROUTINE"
:PRINT
700 LOCATE21,7:PRINT"MONTHLY OR YEARLY -
-- M OR Y"
710 E$="":E$=INKEY$:IF E$="" THEN 710
720 IF E$="M"THEN740  ELSE850
730 STOP
740 CLS:LOCATE31,3:PRINT"MONTHLY"
750 PRINT:PRINT:PRINT:INPUT"MONTH NUMBER
 =  ";MM
755 LOCATE26,9:PRINT"MAKE PREPARATIONS"
756 A=0:PRINT:PRINT TAB(23)"PRESS RETURN
 WHEN READY"
757 G$="":G$=INKEY$:IF G$="" THEN 757
760 M=0:CLS:LOCATE29,10:PRINT"SEARCHING
FOR MONTH --#";MM
770 OPEN "I",#1,"CAS0:DATA"
780 INPUT #1,M,CC,A,B,F,D,E,H,C,FF
790 CLOSE:LOCATE29,12:PRINT"JUST READ
  MONTH --#";M:IF M=MM THEN800  ELSE IF
M<>MM THEN 770
800 CLS:LOCATE31,3:PRINT"MONTH NUMBER";M
:PRINT:PRINT:PRINT
810 GOSUB1080
820 CLS:LOCATE29,10:PRINT"--- ANY MORE M
ONTHS ? <Y/N> ---"
830  GOSUB 440
840 GOTO 740
850 CLS:LOCATE31,3:PRINT"YEARLY"
860 LOCATE26,7:PRINT"MAKE PREPARATIONS"
870 A=0:PRINT:PRINT TAB(23)"PRESS RETURN
 WHEN READY"
875 G$="":G$=INKEY$:IF G$="" THEN 875
880 CLS:LOCATE29,1:PRINT"READING -- YEAR
LY":PRINT:PRINT
890 M=0:Z=0:Y=0:QQ=0:RR=0:PRINT TAB(5)"M
ONTH","  KM","LITRES","COST","KM/LITRE"
900 OPEN "I",#1,"CAS0:DATA"
910 INPUT #1,M,CC,A,B,F,D,E,H,C,FF
920 Z=Z+CC
930 Y=Y+F
940 QQ=QQ+C
950 RR=RR+E
955 CLOSE:PRINT TAB(6) M,C,F,CC,E
960 IF M=12 THEN 970  ELSE 900
970 PRINT TAB(5) "TOTAL",QQ,Y,Z,QQ/Y
980 PRINT:PRINT
990 PRINT TAB(20)"TOTAL LITRES","TOTAL C
OST"
1000 PRINT TAB(26) Y,"  $";Z
1010 PRINT,"TOTAL KMS",,,"AVG KM/L"
1030 PRINT,QQ,,,QQ/Y
1040 PRINT:PRINT:PRINT"                  PR
ESS ANY KEY TO RETURN TO MENU"
1050 GOSUB 470
1060 RETURN
1070 CLS:LOCATE29,10:PRINT"--- THE END -
--":END
1080 PRINT TAB(20)"TOTAL LITRES","TOTAL
COST"
1090 PRINT TAB(26) F,"  $";CC
1100 PRINT,"TOTAL KMS",,,"AVG KM/L"
1110 PRINT,C,,,E
1120 LOCATE21,17:PRINT"PRESS ANY KEY TO
RETURN TO MENU"
1130 GOSUB 470
```

**** CALENDAR ****
LEVEL II

```
10 '**** CALENDAR ****
20 'WRITTEN BY R.J.WIWATOWSKI
40 CLEAR600
50 DEFINTD,I-N,W,Y
60 DIML(11),YR(11,6,4),X$(9,9)
70 DATA31,28,31,30,31,30,31,31,30,31,30,31
80 DATA" 000000 ","00000000","00    00","00    00","00    00","0
0    00","00    00","00    00","00000000"," 000000 "
90 DATA"    1   ","   11   ","  111   ","   11   ","   11   ","
  11   ","   11   ","   11   ","  111111 ","  111111 "
100 DATA" 222222 ","22222222","22    22","      22","  222222","
 222222 ","222     ","22      ","22222222","22222222"
110 DATA"33333333","33333333","     33 ","    33  ","   333  ","
    333 ","     333","33    33","33333333"," 333333 "
120 DATA"     4  ","    44  ","   444  ","  4444  "," 44 44  ","
44  44  ","44444444","44444444","    44  ","    44  "
130 DATA"55555555","55555555","55      ","55      ","5555555 ","
55555555","      55","55    55","55555555"," 555555 "
140 DATA" 666666 ","66666666","66    66","66      ","6666666 ","
66666666","66    66","66    66","66666666"," 666666 "
150 DATA"77777777","77777777","      77","      77","     77  ","
    77   ","   77   ","   77   ","   77   ","   77   "
160 DATA" 888888 ","88888888","88    88","88    88"," 888888 ","
 888888 ","88    88","88    88","88888888"," 888888 "
170 DATA" 999999 ","99999999","99    99","99    99","99999999","
 9999999","      99","99    99","99999999"," 999999 "
180 FORI=0TO11:READL(I):NEXTI
190 FORI=0TO9:FORJ=0TO9:READX$(I,J):NEXTJ:NEXTI
200 B$=CHR$(27)+"G":LPRINTB$;
210 GOTO550
220 FORM=0TO11
230 W=0:DT=1
240 YR(M,D,W)=DT:DT=DT+1:D=D+1
250 IFD>6THEND=0:W=W+1:IFW>4THENW=0
260 IFDT<L(M)+1THEN240
270 NEXTM
280 RETURN
290 Q$=RIGHT$(STR$(Y),4):I1=VAL(MID$(Q$,1,1)):I2=VAL(MID$(Q$,2,1
)):I3=VAL(MID$(Q$,3,1)):I4=VAL(MID$(Q$,4,1))
300 LPRINT:LPRINT:LPRINT
310 LPRINTTAB(20)"M   M III  CCC  RRRR  OOO       88   00"
320 LPRINTTAB(20)"MM MM  I  C   C R  R O   O     8  8 0  0"
330 LPRINTTAB(20)"M M M  I  C     RRR  O   O ***  88  0  0"
340 LPRINTTAB(20)"M   M  I  C   C R  R O   O     8  8 0  0"
350 LPRINTTAB(20)"M   M III  CCC  R  R  OOO       88   00"
360 LPRINT:LPRINT
370 LPRINT"      "+STRING$(70,"*"):LPRINT
380 FORI=0TO9
390 B$=STRING$(18,32)+X$(I1,I)+"    "+X$(I2,I)+"    "+X$(I3,I)+"
    "+X$(I4,I)
400 LPRINTB$
410 NEXTI
420 LPRINT:LPRINT"      "+STRING$(70,"*"):LPRINT:LPRINT:LPRINT
430 RETURN
440 LPRINT:LPRINTA$
450 FORW=0TO4:B$=""
460 FORI=0TO2:B$=B$+"    "
470 FORJ=0TO6
480 IFYR(M+I,J,W)=0THENC$="   "ELSEC$=STR$(YR(M+I,J,W))
490 IFLEN(C$)<3THENC$=" "+C$
500 B$=B$+C$
510 NEXTJ:NEXTI
520 LPRINTB$
530 NEXTW
540 LPRINT:RETURN
550 CLS:PRINTTAB(23)"MICRO-80 CALENDAR":PRINTTAB(23)STRING$(17,"
-"):PRINT
560 PRINT" THIS PROGRAM WILL GENERATE A CALENDAR FOR ANY YEAR IN
 THE RANGE1901 - 1999. ALL YOU HAVE TO DO IS TO SPECIFY THE YEAR
!"
570 PRINT" THE PROGRAM TAKES A FEW SECONDS TO DO THE CALCULATION
S AND YOU CAN SET THE PRINTER TO TOP OF FORM. WHEN EVERYTHING IS
 READY, A HARDCOPY OF THE CALENDAR WILL BE PRINTED.":PRINT
580 A$="     SU MO TU WE TH FR SA":A$=A$+A$+A$
590 H1$=STRING$(11,32)+"JANUARY"+STRING$(18,32)+"FEBRUARY"+STRIN
G$(18,32)+"MARCH"
600 H2$=STRING$(12,32)+"APRIL"+STRING$(21,32)+"MAY"+STRING$(22,3
2)+"JUNE"
610 H3$=STRING$(13,32)+"JULY"+STRING$(20,32)+"AUGUST"+STRING$(17
,32)+"SEPTEMBER"
620 H4$=STRING$(11,32)+"OCTOBER"+STRING$(18,32)+"NOVEMBER"+STRIN
G$(17,32)+"DECEMBER"
630 INPUT"FOR WHICH YEAR DO YOU WANT A CALENDAR ";Y
640 IFY<1901ORY>1999THENPRINT:PRINT"OUT OF RANGE":GOTO630
650 IF4*INT(Y/4)=YTHENL(1)=29
660 I=Y-1901:J=INT(I/4):I=I-4*J+2
670 K=5*(J-7*INT(J/7))+I:D=K-7*INT(K/7)
680 GOSUB220:PRINT:PRINT"PRESS 'NEWLINE' WHEN READY..."
690 IFINKEY$<>CHR$(13)THEN690
700 GOSUB290
710 M=0:LPRINTH1$:GOSUB440
720 M=3:LPRINTH2$:GOSUB440
730 M=6:LPRINTH3$:GOSUB440
740 M=9:LPRINTH4$:GOSUB440
750 B$=CHR$(27)+"H":LPRINTB$;:OUT253,12
760 END
```

**** HEX CONSTANTS ****
LEVEL II

```
10 '---HEX CONSTANTS---(C)COPYRIGHT ROGER BOWLER 1981---
20 DEFINT H-N:PRINT"PLEASE WAIT...":ON ERROR GOTO 110
30 MS=0:POKE VARPTR(MS),PEEK(16561)             'LOCATE 1ST BYTE
40 POKE VARPTR(MS)+1,PEEK(16562):MS=MS+3:HX=MS 'BEYOND MEM SIZE
50 READ A$:IF A$="*" GOTO 130
60 FORI=1TOLEN(A$)-1STEP2
70 H=ASC(MID$(A$,I,1)):L=ASC(MID$(A$,I+1,1))
80 IFH>64THENH=H-55ELSEH=H-48
90 IFL>64THENL=L-55ELSEL=L-48
100 J=H*16+L:POKE MS,J:IF PEEK(MS)=J GOTO 120
110 PRINT"YOU FORGOT TO SET MEMORY SIZE":END
120 MS=MS+1:NEXTI:GOTO50
130 POKE 16789,PEEK(VARPTR(HX)):POKE 16790,PEEK(VARPTR(HX)+1)
140 CLS:PRINT"YOU CAN NOW USE HEX CONSTANTS. HERE IS A DEMO..."
150 FOR I=&H3C40 TO &H3CBF:POKE I,&H86:NEXTI
160 PRINT@&HC0,"OK?"
170 DATA D7,CF48,0604,110000,7E,FE30,381F,FE3A,380A,FE41,3817
180 DATA FE47,3013,D607,E60F,48,0604,CB23,CB12,10FA,B3,5F,41
190 DATA D7,10DC,78,FE04,D29719,ED532141,3E02,32AF40,C9,*
```

**** SERIES IMPEDANCE CIRCUIT ****
LEVEL II

```
10 CLS:PRINT TAB(16)">>> SERIES IMPEDANCE CIRCUIT <<<"
20 PRINT@(84),STRING$(24,131);: PRINT: PRINT
30 PRINT"          A WIDE VARIETY OF ELECTRICAL CIRCUIT PROBLEMS
 OF THIS CATEGORY ARE SOLVEABLE DEPENDING UPON THE KNOWN AND UNKN
OWN VAR-IABLES AVAILABLE.": PRINT
40 'PREPARED BY W.G.HEATH 18 OXLEY ROAD. WARATAH
                          NEWCASTLE . N.S.W. 2298.
50 PRINT"          THE PROGRAMME WILL CALCULATE ALL THE VARIABLE
S  SHOWN IN THE FOLLOWING SCHEDULE SUBJECT TO APPROPRIATE INPUT
VALUES.": PRINT
60 PRINT"          IT WILL HANDLE TWO UNKNOWNS SIMULTANEOUSLY PR
OVIDING  ONE UNKNOWN IS EITHER I, E, OR R, AND THE SECOND IS EITH
ER L, C OR X.  MAKE NO ENTRY FOR THE UNKNOWN VALUES. I.E. PRESS <
ENTER> ONLY WHEN INPUT? FOR THESE VARIABLES IS CALLED FOR."
70 GOSUB 1530
80 PRINT:PRINT:PRINT"          THE PROGRAMME CAN BE USED FOR PRO
BLEMS WHERE NO CAPAC-ITANCE OR, ALTERNATIVELY, NO INDUCTANCE IS P
RESENT.": PRINT
90 PRINT"          INDUCTANCE CAN BE CALCULATED FOR AN INDUCTIVE
 CIRCUIT WITHOUT CAPACITANCE IF I, E, AND R, ARE KNOWN VALUES.":
PRINT
100 PRINT"          FINALLY THE PROGRAMME WILL ALSO OPERATE A SI
MPLE OHM'S LAW SOLUTION ( I = E/R ) BY INPUTTING O ( ZERO ) FOR B
OTH  C   ( CAPACITANCE ) AND L ( INDUCTANCE ) SIMULTANEOUSLY.": P
RINT
110 PRINT"          AFTER ALL CALCULATIONS HAVE BEEN COMPLETED A
 FURTHER  TWO SCROLLS OF THE SCREEN CAN BE MADE WHICH WILL DISPLA
Y A CIR- CUIT DIAGRAM OF THE GENERAL SERIES CIRCUIT FOLLOWED BY A
 VECTOR DIAGRAM AND IMPEDANCE DIAGRAM": GOSUB 1530
120 GOSUB 980
130 GOSUB 1530
140 PRINT@15,">>> INPUT OF KNOWN VALUES <<<"
150 INPUT"CURRENT";I
160 INPUT "VOLTAGE ";E
170 INPUT"RESISTANCE";R
180 INPUT"CAPACITANCE";C
190 INPUT "INDUCTANCE";L
200 INPUT"FREQUENCY";F
210 INPUT"EQUIV REACT";X
220 LET W = 2*3.1416*F
230 IF X=0 AND C=0 AND L=0 AND I=0 GOTO 840
240 IF X=0 AND C=0 AND L=0 AND E=0 GOTO 860
250 IF X=0 AND C=0 AND L=0 AND R=0 GOTO 880
260 IF X=0 AND C=0 AND L=0 GOTO 810
270 IF L=0 AND X=0 GOTO 790
280 IF C=0 AND X=0 GOTO 800
290 IF C=0 GOTO 340
300 IF L=0 GOSUB 730
310 LET W=2*3.1416*F
320 X=(W*L)-1/(W*C)
330 PRINT"EQUIV REACT            =",;X
340 G=W*L
350 PRINT "INDUCTIVE REACT       =",;G
360 GOSUB 1530
370 IF C=0 AND L=0 GOTO 390
380 IF C=0 GOSUB 760
390 IF 0>X LETX=-X
400 IF Y=I GOTO 430
410 IF Y=E GOTO 450
420 IF Y=R GOTO 470
430 I= E/SQR((R[2)+(X[2))
440 PRINT"CURRENT                =",;I
450 E= I*SQR((R[2)+(X[2))
460 PRINT"VOLTAGE                =",;E
470 R=SQR(((E[2)/(I[2))-(X[2))
480 PRINT"RESISTANCE             =",;R
490 T=ATN(X/R)*57.29578
500 PRINT"PHASE ANGLE            =",;T
510 Q=COS(T*.01745329)
520 PRINT"POWER FACTOR           =",;Q
530 P=E*I*Q
540 PRINT"POWER (WATTS)          =",;P
550 Z=SQR((R[2)+(X[2))
```

```
560 PRINT"IMPEDANCE              =",;Z
570 G=W*L
580 PRINT"INDUCTIVE REACT        =",;G
590 VL=I*G
600 PRINT"INDUCTIVE VOLT DROP    =",;VL
610 IF C = 0 GOTO 660
620 J=1/(W*C)
630 PRINT"CAPACITIVE REACT       =",;J
640 VC=I*J
650 PRINT"CAPACITIVE VOLT DROP   =",;VC
660 VR=I*R
670 PRINT"RESIST VOLT DROP       =",;VR
680 IF C=0 GOTO 720
690 IF L=0 GOTO 720
700 M=1/(2*3.1416*SQR(L*C))
710 PRINT"RESONANT FREQ.         =",;M
720 GOTO 910
730 L=(X+(1/(W*C)))/(W)
740 PRINT"INDUCTANCE  =",,;L
750 RETURN
760 C=(1/(W*L-X))/W
770 PRINT"CAPACITANCE  =",,;C
780 RETURN
790 X=1/(W*C): GOTO 390
800 X=W*L: GOTO 390
810 Z=E/I
820 X=SQR(Z[2-R[2)
830 L=X/W: PRINT "INDUCTANCE  =",,;L: GOTO 390
840 I=E/R
850 PRINT "CURRENT  =",,;I
860 E=I*R
870 PRINT "VOLTAGE  =",,;E
880 R=E/I
890 PRINT "RESISTANCE  =",,;R
900 PRINT "INDUCTANCE  =",,;L: GOTO 330
910 GOSUB 1530
920 GOSUB 1280
930 GOSUB 1530
940 GOSUB 1100
950 GOSUB 1530
960 GOSUB 1410
970 END
980 PRINT TAB(18)">>> LIST OF VARIABLES USED <<<"
990 PRINT @(86),STRING$(22,131);: PRINT :PRINT
1000 PRINT "I = CURRENT",,:PRINT "L  = INDUCTANCE"
1010 PRINT "E = VOLTAGE",,: PRINT "C  = CAPACITANCE"
1020 PRINT "R = RESISTANCE",,: PRINT "F  = FREQUENCY"
1030 PRINT "Z = IMPEDANCE",,: PRINT "X  = EQUIVALENT REACTANCE"
1040 PRINT "Q = POWER FACTOR",: PRINT "P  = POWER (WATTS)"
1050 PRINT "G = INDUCTIVE REACTANCE",:PRINT"VL = INDUCTIVE VOLT
DROP"
1060 PRINT "J = CAPACITIVE REACTANCE",:PRINT"VC = CAPACITIVE VOL
T DROP"
1070 PRINT "M = RESONANT FREQUENCY",:PRINT"VR = RESISTIVE VOLT D
ROP"
1080 PRINT "W = 2*3.14159* F",: PRINT " ? = UNKNOWN VALUE"
1090 PRINT TAB(10) "NOTE-- CAPACITANCE USUALLY MEASURED AS MICRO
-FARADS   AND INPUT AS PER EXAMPLE 600E-6 OR ALTERNATIVELY .0006"
: RETURN
1100 CLS: PRINT@52,"E"
1110 PRINT@70,"VL - VC": PRINT@79,CHR$(168);"------------------
---------------";CHR$(148)
1120 PRINT@143,CHR$(170): PRINT@179,":"
1130 PRINT"VECTOR": PRINT@207,CHR$(170): PRINT@243,":"
1140 PRINT"DIAGRAM": PRINT@271,CHR$(170): PRINT@307,":"
1150 PRINT@335,CHR$(170): PRINT@371,":"
1160 PRINT@399,CHR$(170): PRINT@408,"T=ANGLE OF LAG":PRINT@432,"
VR": PRINT@435,":"
1170 PRINT@460,"O": PRINT@463,CHR$(130);"----------------------
------------>-------> I"
1180 LET X1=32:Y1=21:X2=102:Y2=4: GOSUB 1550
1190 PRINT@563,CHR$(168)
1200 PRINT@627,CHR$(170):PRINT@629,"X ="
1210 PRINT"IMPEDANCE":PRINT@691,CHR$(170): PRINT@693,"LW-(1/CW).
"
1220 PRINT"DIAGRAM":PRINT@731,"Z": PRINT@755,CHR$(170): PRINT@75
7,"LW > 1/CW"
1230 PRINT@819,CHR$(170):PRINT@821,"I.E. X IS +"
1240 PRINT@867,"R":PRINT@883,CHR$(170)
1250 PRINT@909,"O": PRINT@912,STRING$(35,140);CHR$(142)
1260 LET X1=33:Y1=42:X2=103:Y2=24: GOSUB 1550
1270 RETURN
1280 CLS: PRINT @66,"----":PRINT@ 70,CHR$(172);CHR$(186);CHR$(17
1);CHR$(186);CHR$(171);CHR$(186);CHR$(171);CHR$(186);CHR$(171);CH
R$(186);CHR$(171);CHR$(186);CHR$(131);"----------"
1290 PRINT@92,STRING$(12,191);"------------";CHR$(170);" ";CHR$(1
49);"--------->": PRINT@185,"CURRENT"
1300 PRINT@203,"RES.": PRINT@224,"IND.": PRINT@243,"CAP."
1310 PRINT@259,CHR$(170);"<------ VR ------>";CHR$(138);"<------
-- VL --------->";CHR$(138);"<---- VC ---->";CHR$(170)
1320 PRINT@323, CHR$(170);"<------------------- APPLIED VOLTAGE '
E' ---------------->"; CHR$(170)
1330 PRINT@475, CHR$(170);" VL (LEAD)": PRINT@495, CHR$(168);"--
------------> I"
1340 PRINT@539, CHR$(170): PRINT@559, CHR$(170)
1350 PRINT@603, CHR$(170): PRINT@623, CHR$(170)
1360 PRINT@667, CHR$(170): PRINT@687, CHR$(170)
1370 PRINT@708, "--------------> VR": PRINT@731, CHR$(170): PRINT
@751, CHR$(170)
1380 PRINT@772,"--------------> I": PRINT@795, CHR$(130);"-------
-------->  I": PRINT@815, CHR$(138);" VC (LAG)"
1390 PRINT@854, "GENERAL SERIES CIRCUIT"
1400 PRINT@918, STRING$(22,131):RETURN
1410 PRINT TAB(11)">>> REVIEW OF VALUES OF ALL VARIABLES <<<"
1420 PRINT@79,STRING$(33,131)
1430 PRINT"CURRENT       I =";I,;"INDUCTANCE     L =";L
1440 PRINT "VOLTAGE       E =";E,;"FREQUENCY      F =";F
1450 PRINT"RESISTANCE    R =";R,; "CAPACITANCE    C =";C
1460 PRINT"EQUIV REACT   X =";X,; "IMPEDANCE      Z =";Z
1470 PRINT"PHASE ANGLE   T =";T,; "POWER FACTOR   Q =";Q
```

```
1480 PRINT"IND. REACT.    G =";G,; "IND.VOLT DROP VL =";VL
1490 PRINT"CAP. REACT.    J =";J,; "CAP.VOLT DROP VC =";VC
1500 PRINT"R.VOLT DROP   VR =";VR,;"RESONANT FREQ. M =";M
1510 PRINT"POWER (WATTS) P =";P
1520 PRINT@848,"-- ALL CALCULATIONS COMPLETED --": RETURN
1530 PRINT@(964),"< ENTER >";: INPUT A$
1540 CLS: RETURN
1550 IF ABS(X2-X1)<ABS(Y2-Y1) GOTO 1580
1560 DY=(Y2-Y1)/ABS(X2-X1)
1570 IF X2>X1 GOTO 1640
1580 FOR N=X1 TO X2 STEP-1
1590 SET(N,Y1)
1600 Y1=Y1+DY
1610 IF Y1<0 THEN Y1=0
1620 NEXT N
1630 RETURN
1640 FOR N=X1 TO X2
1650 SET (N,Y1)
1660 Y1=Y1+DY
1670 IF Y1<0 THEN Y1=0
1680 NEXT N
1690 RETURN
1700 DX=(X2-X1)/ABS(Y2-Y1)
1710 IF Y2>Y1 GOTO 1780
1720 FOR N=Y1 TO Y2 STEP -1
1730 SET(X1,N)
1740 X1=X1+DX
1750 IF X1<0 THEN X1=0
1760 NEXT N
1770 RETURN
1780 FOR N=Y1 TO Y2
1790 SET (X1,N)
1800 X1=X1+DX
1810 IF X1<0 THEN X1=0
1820 NEXT N
1830 RETURN
```

****** DR. WHO - LEVEL II ******
INITIALISER

```
10 CLEAR5000:DEFINTA-Z:DEFSTRS'
  PROGRAM: Initialliser for Dr Who V1.1
  AUTHOR:  James Smith
  DATE:    5th March,1982
  ADDRESS: 6 Northern Ave, TARRO 2322
20 CLS:PRINT"              Doctor Who data file initialliser

Disk or Tape (D/T) ?
"
30 A$=INKEY$:IFA$="D"THEND=1:PRINT"Creating disk file DRWHO/DAT.
"ELSEIFA$="T"THEND=-1:PRINT"Dumping data to tape."ELSE30
```

```
40 IFD<>-1OPEN"O",1,"DRWHO/DAT"
50 S="":FORI=1TO210:READJ:S=S+CHR$(J):NEXTI:IFD<>-1THENPRINT#D,C
HR$(34);S;CHR$(34)ELSEPRINT#-1,CHR$(34);S;CHR$(34)
60 DATA255,159,159,255,47,243,145,255,255,31,84,255,159,246,243,
247,111,63,100,102,87,86,255,255,255,255,241,66,255,240,104,152,1
52,85,50,255,21,63,255,21,242,255,255,243,255,17,50,253,112,152,2
23,150,152,137,112,96,7,240,118,112
70 DATA147,105,255,63,255,243,248,255,255,1,96,248,136,136,159,2
55,246,255,115,240,255,246,249,255,68,68,50,240,112,244,255,255,1
27,247,255,247,255,132,159,238,238,233,119,39,255,255,247,246,255
,255,95,68,84,16,255,242,255,255,255,50
80 DATA146,134,253,146,51,255,24,48,253,37,17,253,238,238,246,83
,117,253,120,112,79,105,86,253,96,146,253,23,128,253,62,228,254,4
1,120,255,113,54,111,231,226,242,126,9,247,142,158,249,232,46,248
,52,33,63,101,25,95,24,69,79
90 DATA153,153,153,66,84,255,20,51,255,120,99,255,33,81,255,120,
70,31,255,240,255,57,136,245,55,87,255,99,99,112
100 S="":FORI=1TO70:READJ:S=S+CHR$(J):NEXTI:IFD<>-1THENPRINT#D,C
HR$(34);S;CHR$(34)ELSEPRINT#-1,CHR$(34);S;CHR$(34)
110 DATA99,1,2,3,4,5,6,7,8,9,10,11,12,55,99,14,15,10,10,10,16,17
,23,19,18,21,22,20,18,24,25,32,27,28,29,30,31,26,33,99,35,36,35,3
5,37,35,38,35,35,35,39,40,41,42,43,44,45,46,47,48,50,51,52,49,49,
50,53,50,49,50
120 S="":FORI=1TO16:FORJ=1TO4:READK:S=S+CHR$(K):NEXTJ,I:IFD<>-1T
HENPRINT#D,CHR$(34);S;CHR$(34)ELSEPRINT#-1,CHR$(34);S;CHR$(34)
130 DATA99,1,99,8,6,2,5,9,58,3,5,8,12,4,2,8,19,5,10,66,23,6,1,8,
25,7,2,43,22,8,1,8,30,9,3,27,35,10,1,8,40,11,2,9,44,12,1,26,48,17
,2,9,50,14,1,59,53,15,1,8,8,16,1,43
140 ST="":FORI=1TO78:READX:ST=ST+CHR$(X):NEXTI:IFD<>-1THENPRINT#
D,CHR$(34);ST;CHR$(34)ELSEPRINT#-1,CHR$(34);ST;CHR$(34)
150 DATA31,36,36,42,45,42,20,17,38,52,45,46,51,6,50,33,59,16,6,2
6,3,3,21,7,8,15,60,25
160 DATA35,22,55,37,27,7,9,36,39,9,40,14,38,58,56,1,1,41,22,19,8
,49,32,38,12
170 DATA37,23,33,10,39,2,40,99,11,46,57,43,99,2,35,41,17,48,53,5
4,5,5,4,4,44
180 PRINT"Initiallisation finished.":IFD<>-1CLOSED
```

****** DR. WHO - LEVEL II ******
MAIN PROGRAM

```
10 GOTO640'Dr Who V3.1,James Smith,6 Northern Ave, TARRO 2322
20 PRINTS7"deep pit.":GOSUB580:RETURN
30 PRINTS7"small chamber.":RETURN
40 PRINTSY"following a trail around a steep cliff.":RETURN
50 PRINT"The path forks here.":RETURN
60 PRINTS8"top";:GOTO590
70 PRINTS8"base";:GOTO590
80 PRINTSY"lost in the maze.":RETURN
90 PRINT"The path widens for a bit.":RETURN
100 PRINTS7"secret room.":RETURN
110 PRINTS7"passage near some stairs.":RETURN
120 PRINTS8"junction of four underground passages.":RETURN
```

```
130 PRINTS7"big valley. To the south stands a vast black
monolith. "S9"a thick haze to the north.":RETURN
140 GOSUB570:PRINT"A message scrawled on it says: 'DIG HERE'":RE
TURN
150 PRINTS7"small cave of broken rocks.":RETURN
160 PRINTS8"base of the monolith. "S9"a small grate
at your feet.":RETURN
170 GOSUB120:PRINT"Under a grate.":RETURN
180 PRINTS6"Daleks.  Passages lead off in all
directions.  I would not try to get past the Daleks, however.":R
ETURN
190 PRINTS8"top of a hill looking down upon a domed city.":RETUR
N
200 PRINTSY"in the city's drains.  Tunnels lead off in all
directions..  ";:GOSUB580:RETURN
210 PRINTS8"gates of the city.  At your feet is a manhole
cover.":RETURN
220 PRINTSY"in the Dalek master strategy room.  Red lights are
flashing and sirens screaming.  I would leave.":RETURN
230 PRINTSY"in an alcove that had been hidden behind a
deactivated Dalek.":RETURN
240 PRINTS6"broken machinery.":RETURN
250 PRINTS6"Bubbling Beakers, Burning Bunsens,
Filter Funnels, Colourful Chemicals, etc.":RETURN
260 PRINTSY"inside the Dalek experimentation room.  I  wouldn't
linger, as the experiments look hungry.":GOSUB580:RETURN
270 PRINTS8"bottom of a deep dust-filled hole.":RETURN
280 PRINTSY"just inside a vast crater.  "S9"a ship to your
north, a deep hole to your south, and a set of rough stone
steps leading up the crater wall near a cave entrance.":RETURN
290 PRINTSY"inside the ship near the airlock.":RETURN
300 PRINTSH"just entered a room full of Cybermen. Back out very
slowly and they might not see you.  Be carefull!":RETURN
310 PRINTS8"base of the Cybership.":RETURN
320 PRINTS7"cave in the cliff face.":RETURN
330 PRINTSY"beneath the Cybership.":RETURN
340 PRINTS8"top of a cliff overlooking a spaceship.":RETURN
350 PRINTS6"heavy machinery.":RETURN
360 PRINTS6"television screens showing views of
different areas.  For example, one shows a white crystal lying
beside a mountain path.":RETURN
370 PRINTSY"lost in the slime.  "S9"a tree in the distance.":RET
URN
380 PRINTSY"standing at the high point on a vast plain of slime.
"S9"a lone tree to your north.":RETURN
390 PRINTS8"top of a tall tree.  The tardis can be seen to
the south.":RETURN
400 PRINTSY"at a clearing in the slime.  "S9"a tall tree here.":
RETURN
410 PRINTSY"following a narrow path along the edge of the cliff.
":RETURN
420 PRINTSY"in the midst of a thick fog.":RETURN
430 PRINTS7"valley between two mountains.  A thick fog is
rolling in from the north.":RETURN
440 GOSUB610:PRINT"upon a vast
expanse of ocean.":RETURN
450 GOSUB610:PRINT"into a
bottomless chasm filled with writhing yellow fog.":RETURN
460 PRINTSY"on the brim of a deep volcano.":RETURN
470 PRINTS8"summit of a very tall mountain.  "S9"a
thick fog here.":RETURN
480 GOSUB620:PRINT"4' chimney from which is pouring
ia very dense thick yellow smog.":RETURN
490 GOSUB620:PRINT"small hole into which the fog is
flowing.":RETURN
500 GOSUB620:PRINT"fast flowing river.  The water
is a dull yellow shade.":RETURN
510 PRINTS8"intersection of two passages.":RETURN
520 GOSUB510:GOSUB580:RETURN
530 PRINTS6"broken down tardises.":RETURN
540 GOSUB510:PRINT"A sign nearby says:
",:GOSUB1640:RETURN
550 PRINTS7"magnificent chamber. "S9"a large throne here.":RETUR
N
560 GOSUB630:PRINT", with a
hole in it.":RETURN
570 GOSUB630:PRINT".":RETURN
580 PRINT"There are some stairs here.":RETURN
590 PRINT" of a steep incline.":RETURN
600 PRINT"Okay":GOTO780
610 PRINTS8"top of a mountain looking down ";:RETURN
620 PRINTS7"valley beside a ";:RETURN
630 PRINTS8"base of an unscalable wall of rock";:RETURN
640 CLEAR650:DEFINTA-Z:DEFSNGC:DEFSTRS
650 DIMSO(17),D(69,6),O(16,4),SI(6),SX(6),V(2),SW(5),L(6),PI(7)
660 DV=-1:SY="You are ":SH="You have ":S7="You are in a ":S8="Yo
u are at the ":S9="There is ":S6="You are in a room full of ":CLS
:PRINT@342,"Doctor  Who";
670 DATAAggador,a pick,a desionating renticulator,a sonic screwd
river,a giant blue spider!!!,a bag of jelly babies,a Dalek ray-gu
n,a copy of 'Playdalek',a large rock,a long scarf,a strange looki
ng object,a bunch of bananas,a dead spider
680 DATAa white crystal,a blue crystal,a sionated cumquat,a skul
l
690 DATAgroup of Peladonians,trio of ugly mutants,group of Dalek
s,Cyberman,single loathesome horrible creature,Troglodyte,Timelor
d,49,56,57,58,27,59,60,2,3,4,6,5,99,1
700 SF="121113211213122312221222122212221122112411211221111111211
1131122111113511111313331211131112131223111113111131113"
710 SC="AGGBABBAGBANBLUBUNCLOCOMCOPCRECRYCUMCYBD  DALDESDIEDIGDO
WDROE  EASEATENTEXIFIRGALGETGIAGIVGRAGUNHIDIN INVJELLARLISLONLOOM
AGMOOMUTN  NOROBJOFFOPEOUTPELPICPLAQUIRAYREARENRESROCS  SCASCRSEA
SIOSKASKUSONSOUSPISTRTALTARTIMTROU  UP W  WESWHI"
720 REM OPEN FILE HERE FOR DISK
730 INPUT#-1,SP:INPUT#-1,SD:INPUT#-1,SO:INPUT#-1,S1:S1=LEFT$(S1,
60)+CHR$(34)+MID$(S1,62,4)+CHR$(34)+RIGHT$(S1,12)
740 FORI=1TO16:FORJ=1TO4:O(I,J)=ASC(MID$(SO,(I-1)*4+J,1)):NEXTJ,
I:FORI=0TO69:FORJ=1TO5STEP2:X=ASC(MID$(SP,I*3+(J+1)/2,1)):D(I,J)=
INT(X/16):D(I,J+1)=X-INT(X/16)*16:NEXTJ,I:FORI=0TO69:D(I,0)=ASC(M
ID$(SD,I+1,1)):NEXTI
750 RESTORE:FORI=1TO17:READSO(I):NEXT:FORI=0TO6:READSI(I):NEXT:F
ORI=0TO6:READL(I):NEXT:FORI=1TO7:READPI(I):NEXT
```

```
760 RANDOM:Q9=0:C=0:WT=0:TI=0:L=6:P0=1:P=61:TL=20+RND(20):CLS
770 D(14,0)=13:D(39,0)=34:D(63,3)=2:D(63,4)=2:O(1,1)=0:O(1,2)=1:
D(0,0)=0:O(1,3)=0:D(69,1)=0:D(69,2)=0:D(69,3)=0:D(69,4)=0:GOTO107
0
780 IFP0=99P=99ELSEP=L*10+P0
790 IFP=60RP=80RP=250RP=440RP=990RL=4ANDQ9THEN840
800 IFC>0C=C+RND(0)
810 IF(P=660RP=7)ANDC=0ANDRND(0)>.40RRND(0)>.9ANDC=0C=1
820 IFP=19ANDO(5,2)=5IFC<4THEN840ELSEPRINT"The spider has eaten
you.":GOTO1420
830 IFC=1PRINT"Ohoh, here comes a "SI(L)"!"ELSEIFCPRINTS9"a "SI(
L)" here!"
840 A$="":INPUTA$:IFA$=""140
850 V(0)=100:V(1)=100:V(2)=100:FORI=1TO5:SW(I)="":NEXTI
860 J=0:K=-1:FORI=1TOLEN(A$):X$=MID$(A$,I,1):IFX$=" "THENIFKTHEN
NEXTIELSEK=-1:NEXTIELSEIFNOTKTHENSW(J)=SW(J)+X$:NEXTIELSEIFJ<5THE
NK=0:J=J+1:SW(J)=X$:NEXTI
870 FORI=1TOJ:SW(I)=LEFT$(SW(I)+"    ",3):NEXTI:K=0:FORI=1TOJ:A1=
1:AN=78:FORI1=1TO78:AI=INT((A1+AN)/2):X$=MID$(SC,AI*3-2,3):IFSW(I
)>X$A1=AI+1ELSEAN=AI-1
880 IFX$<>SW(I)ANDA1<=ANNEXTI1ELSEIFX$=SW(I)V(K)=ASC(MID$(S1,AI,
1)):K=K+1:IFK>2THENGOSUB1840ELSENEXTI:GOSUB1840ELSENEXTI:GOSUB184
0
890 IFRND(0)>.998ANDWTANDPS<>99PRINTSY"hit over the back of the
head and everything goes black
...You awake to find that everything you were holding is gone.":
FORI=2TO16:IFO(I,1)=90THENO(I,1)=6:NEXTI:GOTO840ELSENEXTI:GOTO840
900 IFV(0)=22ANDV(2)=100ORV(1)=100AND(V(0)>17ANDV(0)<27ANDV(0)<>
22)PRINT"Please be more specific.":GOTO840
910 IFV(0)=33ANDV(1)=46THENIFO(3,1)=90ANDO(16,1)=900(16,1)=91:PR
INTSH"desionated the cumquat into";:GOTO1410ELSE1500
920 ONV(0)GOTO1110,1110,1110,1110,1110,1110,1190,1170,1020,1200,
1240,1440,840,1060,1370,1280,970,840,1310,1310,1270,1350,1340,840
,930,950,1040:PRINT"What?":GOTO840
930 IFV(1)<31ORV(1)>46THEN1450ELSEX1=V(1)-30:IFO(X1,1)=90THEN146
0ELSEIFO(X1,1)<>PTHEN1480ELSEIF(O(X1,4)AND8)=0THEN1450ELSEIFO(X1,
3)+WT>20THEN1490
940 O(X1,1)=90:WT=WT+O(X1,3):O(X1,4)=(O(X1,4)OR1)-1:GOTO600
950 IFV(1)<31ORV(1)>46THEN1450ELSEX1=V(1)-30:IFO(X1,1)<>90THENIF
O(X1,1)<>PORO(X1,1)=91THEN1480ELSE1500ELSEIFV(1)=31THEN1510
960 WT=WT-O(X1,3):O(X1,1)=P:GOTO600
970 IFC=0THEN1520ELSEIFP=7THEN1570ELSEIFL=4ANDC<0THEN1620ELSEIFP
=66GOSUB1000:IFNO<6THEN1750ELSE1430
980 ONL+1GOTO1580,1520,1590,1600,1610,990,1630
990 ONRND(3)GOTO1650,1660,1670
1000 QC=0:NO=0:FORI=1TO16:IF(O(I,4)AND2)ANDO(I,1)=90NO=NO+1:QC=Q
C+(O(I,4)AND240)/16
1010 NEXTI:RETURN
1020 PRINTSY"presently holding:":NO=0:FORI=1TO16:IFO(I,1)=90PRIN
T,SO(O(I,2)):NO=NO+1
1030 NEXTI:IFNO=0PRINT,"nothing":GOTO780ELSE780
1040 IFL=6ORC=0PRINTS9"no need to hide!":GOTO780ELSEIFP=19ANDD(1
9,1)=15THEN1450ELSEIFRND(0)>.95PRINT"The creature that you bumped
 as you rushed desperately past was  faster than you.  He caught
and killed you.":GOTO1420ELSEC=0
1050 IFL=5PO=1:P=51ELSEIFL=4PO=4:P=44ELSEPO=6:P=L*10+P0
1060 IFP0=99PRINTSY"inside the tardis.":GOTO1090
1070 ONO(P,0)+1GOSUB20,30,40,50,60,70,80,90,100,110,120,130,140,
150,160,170,180,190,200,210,220,230,240,250,260,270,280,290,300,3
10,320,330,340,350,360,370,380,390,400,410,420,430,440,450,460,47
0,480,490,500,510,520,530,540,550,560,570,580,590,600
1080 IFP0=1PRINT"The tardis is sitting off to one side."
1090 GOSUB1820:NO=0:FORI=1TO16:IFP=O(I,1)AND(O(I,4)AND1)=0NO=NO+
1:IFNO=1THENPRINT"Around you you see:":PRINT,SO(O(I,2))ELSEPRINT,
SO(O(I,2))
1100 NEXTI:GOTO780
1110 IFP0=99PRINTSY"still in the tardis.":GOTO780ELSEY=O(P,V(0))
:IFP=19ANDD(19,1)=15THEN1680ELSEIFY=15THEN1530ELSEIFY=130NLGOTO017
00,1110,1110,1740ELSEIFY=140NL-2GOTO1710,1720,1730
1120 IFL<>6ANDC>2.5ANDRND(0)>.5IFL>2THENPRINT"He has";:GOTO1690E
LSEPRINT"They have";:GOTO1690
1130 IFP=36ANDRND(0)>.3PRINT"The ship just blasted off.  As you
were underneath it at the
time, "SY"now slightly incinerated.":GOTO1420
1140 IFP=62ANDRND(0)>.3PRINTSH"been hit by a low flying tardis."
:GOTO1420
1150 IFP=6ANDRND(0)<.9Y=P0
1160 P0=Y:P=L*10+P0:C=-(P=200RP=330RP=66):GOTO1060
1170 F=0:IFP0<>99S="already outside"ELSES="now outside":P0=1:F=-
1:P=1+L*10
1180 PRINTSY;S" the tardis.":IFFTHEN1060ELSE780
1190 F=0:C=0:IFP0=99S="already inside":GOTO1180ELSEIFP0<>1THEN15
50ELSES="now inside":P0=99:P=P0:GOTO1180
1200 IFP0<>99THEN1540ELSETI=TI+1:IFTI>TLTHENPRINT"Your tardis ha
s run out of power .. "SY"'Lost in Space'!!":GOTO1420
1210 FORI=0TO6:IFV(1)=L(I)D=IELSENEXTI:D=RND(7)-1
1220 IFRND(2)=1D=RND(10)-1:IFD>6PRINTSH"materialised in space.
I will reset the tardis for
you.":D=RND(7)-1
1230 L=D:PRINTSH"materialised on ";:IFL=3PRINT"the dark side of
the Moon":GOTO780ELSEPRINTMID$("Peladon      Mutos        Skaro
              Hidaous      DiethylamideGalafry",L*12+1,12):GOTO78
0
1240 PRINTSH"found:":F=0:IFP=6ANDRND(0)>.3ORL=4ANDP0<>6ANDP0<>4A
NDP0<>1ANDRND(0)>.7THEN1260ELSEFORI=1TO16:IFO(I,1)=PTHENF=F+1:PRI
NT,SO(O(I,2)):O(I,4)=(O(I,4)OR5)-1
1250 NEXTI:IFP=26F=F+1:PRINT"      a secret passage hidden behind
 a deactivated Dalek.":D(26,3)=5
1260 IFFTHEN780ELSEPRINT,"nothing":GOTO780
1270 IFV(1)=36ORV(1)=42ORV(1)=46IFO(V(1)-30,1)=90THENO(V(1)-30,1
)=91:PRINT"Delicious!!":GOTO780ELSE1500ELSE1450
1280 IFO(2,1)<>90THENPRINTSH"nothing to dig with.":GOTO780ELSEIF
P=12ANDD(12,4)=15THEND(12,4)=6:D(12,0)=54:GOTO1300ELSEIFP=13ANDD(
13,3)=15THEND(13,3)=4:D(13,0)=54:GOTO1300
1290 PRINT"You haven't dug up anything useful.":GOTO780
1300 PRINTSH"broken a hole in the wall with your pick.  You can
see
a vague chamber behind it.":GOTO780
1310 IFV(1)<>55ANDV(2)<>55THEN1450ELSEIFL<>10RP0<50RP0>6THEN1480
ELSEIFO(4,1)<>90THEN1450ELSEIFV(0)=20THEN1330
1320 D(15,6)=6:D(16,5)=5:GOTO600
1330 D(15,6)=13:D(16,5)=13:GOTO600
```

```
1340 IFV(1)=38IFO(8,1)=90THENPRINT"This does nothing for me, you
 know.":GOTO780ELSE1500ELSEIFV(1)=33IFO(3,1)=90THENPRINT"It says"
;:GOSUB1000:PRINTABS(NO+RND(3)-2+RND(0)):GOTO780ELSE1500ELSE1450
1350 IFV(1)=35ANDV(2)=45ANDO(15,1)=90ANDP=19ANDD(19,1)=15C=0:D(1
9,1)=7:O(5,1)=14:O(5,4)=O(5,4)OR8:O(5,2)=13:GOTO1760
1360 IFV(1)<31ORV(1)>46ORV(2)<49ORV(2)>56THEN1450ELSEY=PI(V(2)-4
9):IFY=99ORY<>LORC=00RO(V(1)-30,1)<>90THEN1450ELSEY=VAL(MID$(SF,(
V(1)-30)+16*Y,1)):ONYGOTO1770,1780,1790,1800,1810
1370 IFV(1)<>37THEN1450ELSEIFO(7,1)<>90THEN1500ELSEIFC=0PRINTS9"
nothing here to fire at.":GOTO780ELSEC=0
1380 IFL=6PRINTS9"a loud explosion and ... Hey that was a Timelo
rd!
Just whose side are you on?  That's it for you, buster!":GOTO142
0
1390 IFP=19D(19,1)=7:O(5,1)=91
1400 PRINTS9"a loud explosion and a brilliant flash, and you fin
d
yourself looking at";:IFL=4Q9=1
1410 PRINT" a small pile of grey powder
which slowly dissipates.":GOTO780
1420 PRINTSH"failed ... the universe will be destroyed ... and a
ll
the blame lies on your shoulders ...":GOTO1440
1430 PRINTSH"found all six parts!!  We are saved!!!
","Congratulations!!!!"
1440 GOSUB1000:QC=(QC*NO*100)*TL/(TI+1):PRINT"You scored"QC:INPU
T"Want to try again";X$:IFLEFT$(X$,1)="N"THENCLS:ENDELSE740
1450 PRINT"I can't quite see how to do that.":GOTO780
1460 PRINT"You're already carrying it.":GOTO780
1470 PRINT"You can't do that!":GOTO780
1480 PRINT"I can't see that here.":GOTO780
1490 PRINT"You can't carry all this and that too.  You'll have t
o drop
something first.":GOTO780
1500 PRINT"You aren't carrying it.":GOTO780
1510 PRINT"He doesn't seem to want to go away.":GOTO780
1520 PRINTS9"nobody else here who can talk.":GOTO780
1530 PRINTS9"no way to go in that direction.":GOTO780
1540 PRINTSH"to be in the tardis to use it.":GOTO780
1550 PRINTS9"no tardis here.":GOTO780
1560 PRINT"You can't get through the grate without opening it fi
rst.":GOTO780
1570 PRINT"They have spoken of a secret doorway behind a nearby
curtain.":D(7,3)=8:GOTO780
1580 PRINT"One of them poked you with a spear, but you were not
killed,
just mortally wounded.":GOTO780
1590 PRINT"'E x t e r m i n a t e' ... it zapped you.  "SY"now a
slowly evaporating pile of grey powder.":GOTO1420
1600 PRINT"'Have you got a spot of oil on you?'":GOTO780
1610 PRINT"'Creature hungry ... can creature eat you?'":GOTO780
1620 PRINT"'I say, these sweeties are simply spiffing.  Rather.
 Not at
all like those bananas.  Crunchy bananas are just simply not
on, what?'":C=.01:GOTO780
1630 GOSUB1640:GOTO780
1640 PRINT"'BEWARE OF LOW FLYING TARDISES'":RETURN
1650 PRINT"'Eeeeeeeeeeeee.....................' (Unintelligable)":GO
TO780
1660 PRINT"The fog muffles your voice so that he can't hear you.
":GOTO780
1670 PRINT"He has spoken of a strange crystal on a mountain many
 miles
away ...":GOTO780
1680 PRINT"As you approached the spider, it turned red and start
ed spittingyellow poison.  I wouldn't try that again!":GOTO780
1690 PRINT" taken an intense dislike to you and torn
you to pieces.":GOTO1420
1700 PRINTSH"to open the grate first.":GOTO780
1710 PRINTSH"been strangled by a Cyberman.":GOTO1420
1720 PRINT"You jumped from the tree and broke your neck.  Silly
you.":GOTO1420
1730 PRINTSH"jumped to your doom.":GOTO1420
1740 PRINTSH"taken a mouth full of slime.  (Uggh!!!)":GOTO780
1750 PRINT"'These are not the right parts.  Take them from my si
ght!'":GOTO780
1760 PRINT"The spider looked deep into the crystal, turned green
 and rose
slowly up through the roof.  I think it was dead!":GOTO780
1770 PRINT"He doesn't seem interested in it.":GOTO780
1780 PRINT"He takes it and scarpers.":C=0:O(V(1)-30,1)=L*10+RND(
10)-1:GOTO780
1790 PRINT"He eats it.":O(V(1)-30,1)=91:C=.01:GOTO780
1800 PRINT"The Daleks take one look at your copy of 'Playdalek'
and freak
out down separate tunnels doing cartwheels and blasting the
walls in strange ways.  (This must be hot stuff!!)":C=0:GOTO780
1810 PRINT"The creature has calmed down a little and looks frien
dly (ugly,
but friendly)...even talkative!":C=-1:GOTO780
1820 IFP=99RETURNELSEPRINT"You can go";:FORI=1TO6:IFD(P,I)<>15IF
I<3PRINTMID$(" north, south,",I*7-6,7);ELSEIFI=5PRINT" up,";ELSEP
RINTMID$(" east, west,      , down,",I*6-17,6);
1830 NEXT:PRINTCHR$(8)".":RETURN
1840 IFV(0)>V(1)ORV(0)>V(2)T=-((V(1)<=V(2))*1+(V(1)>V(2))*2):T1=
V(0):V(0)=V(T):V(T)=T1
1850 IFV(1)>V(2)T=V(2):V(2)=V(1):V(1)=T:RETURNELSERETURN
1860 SAVE"DRWHO/TBS"
```

****** DR. WHO - LEVEL II ******
DISK CHANGES

```
720 OPEN"I",1,"DRWHO/DAT
730 INPUT#1,SP:INPUT#1,SD:INPUT#1,SO:INPUT#1,S1:S1=LEFT$(S1,60)+
CHR$(34)+MID$(S1,62,4)+CHR$(34)+RIGHT$(S1,12):CLOSE1
```

***** NEXT MONTH'S ISSUE *****

Next month's issue will contain at least the following programs plus the usual features and articles. An (80) after a program title indicates that the program will be for TRS-80 Model 1/3 or System 80/Video Genie computers. (Colour) indicates that the program will be for the TRS-80 Colour Computer and the Hitachi Peach.

** JUMP THE RAPIDS LII/16K (80) **

This game makes use of the graphic utility (MOVIE) published in MICRO - 80 issue 22. In this game you have to cross a river by jumping from log to log, but with the graphic utility Movie driving the graphics, it's not easy.

** MORSE CODE TRANSMITTER LII/4K-16K **

This morse code program will transmit morse code out to the cassette port. The code can be random or can be supplied by you. As actual morse code is transmitted by this program it is conceivable that the computer output could be hooked up to a transmitter for live transmission.

** CHEQUE BOOK DATA FILE (COLOUR) **

This program enables you to save all your cheque book transactions on a cassette data file and retrieve them at will. A better way to check queries than to search through the stubs!

** FAULT FINDER LII/16K (80) **

This program is a problem in deductive logic. The scenario is of a machine (fortunately fictitious), which is subject to three particularly undesirable faults when combinations of actions are taken. The computer will act as your agent in performing the actions that you order and reporting the results. You are required to determine what the common features of combinations of actions which produce the faults are and, hence, by trial and error, how to avoid the faults. (Huh! - Ed.)

** CHEQUE ACCOUNT MANAGER LII/16K (80) **

This program will store up to 50 transactions of your cheque account. It maintains a balance of the account. Being fully interactive, it will check bank statements, edit records, sort records and run record searches.

** PAYROLL (COLOUR) **

A simple payroll program originally designed to operate on a Level II, 16K cassette system. This program will allow you to manage the payroll for a small staff on your Colour Computer.

drive cabinet/power supply as illustrated, two drive cable and the version of DOSPLUS indicated.

single drive cabinet/power supply as illustrated.

If it's a dual-drive system you need, then take advantage of our dual-drive package and

SAVE a further $40 on the price of two single-drive packages ...

DRIVE TYPE	No. of Tracks	No. of Heads	Capacity	Dosplus Version	Price
2 x MPI B51	40 ea	1 ea	2 x 100K	3.3	$874
2 x MPI B52	40 ea	2 ea	2 x 200K	3.4	$1125
2 x MPI B92	80 ea	2 ea	2 x 400K	3.4	$1454

Dual-drive package includes two bare disk drives, self-contained dual-drive cabinet/power supply as illustrated, two drive cables and the version of Dosplus indicated.

NOTE: All 40 track drives are completely compatible with 35 track operating systems such as TRSDOS. DOSPLUS allows you to realise an additional 14% capacity compared with TRSDOS. Under DOSPLUS 3.4, 80 track drives can read 35/40 track diskettes.

All disk drive components are still available separately:

BARE DRIVES — MPI drives offer the fastest track-to-track access time (5 milliseconds) available. All drives are capable of operating in double density for 80% greater storage capacity.

	Price		Freight
MPI B51 40 track, single-head, 100K	$399	New, Reduced Price	$5.00
MPI B52 40 track, dual-head, 200K	$449		$5.00
MPI B92 80 track, dual-head, 400K	$619		$5.00
Simple, wrap-around cabinet	$12		$2.00
Separate, dual-drive power supply	$85		$8.00

	Price	Freight
Self-contained, single drive cabinet/power supply	$99	$5.00
Self-contained, dual-drive cabinet/power supply	$135	$5.00
Two drive cable	$39	$2.00
Fan drive cable	$49	$2.00
DOSPLUS 3.3	$99.95	$2.00
DOSPLUS 3.4	$149.95	$2.00

Prices are FOB Adelaide. Add $5.00 freight for single drive package, $10.00 for dual-drive package. Prices are in Australian dollars. Freight is road freight anywhere in Australia.

All items carry a 90-day parts and labour warranty. Repairs to be carried out in our Adelaide workshops.

LEVEL 2 ROM

ASSEMBLY LANGUAGE TOOLKIT

by Edwin Paay

FOR TRS-80 MODEL 1, MODEL 3 AND SYSTEM 80/VIDEO GENIE

This is a new package consisting of two invaluable components:

- **A ROM REFERENCE** Manual which catalogues, describes and cross-references the useful and usable ROM routines which you can incorporate into your own machine language or BASIC programs.
- **DBUG**, a machine language disassembling debugging program to speed up the development of your own machine language programs. DBUG is distributed on a cassette and may used from disk or cassette.

Part 1 of the ROM REFERENCE manual gives detailed explanations of the processes used for arithmetical calculations, logical operations, data movements etc. It also describes the various formats used for BASIC, System and Editor/Assembly tapes. There is a special section devoted to those additional routines in the TRS-80 Model 3 ROM. This is the first time this information has been made available, anywhere. Differences between the System 80/Video Genie are also described. Part 1 is organised into subject specific tables so that you can quickly locate all the routines to carry out a given function and then choose the one which meets your requirements.

Part 2 gives detailed information about each of the routines in the order in which they appear in the ROM. It describes their functions, explains how to use them in your own machine language programs and notes the effect of each on the various Z80 registers.

Part 2 also details the contents of system RAM and shows you how to intercept BASIC routines. With this knowledge, you can add your own commands to BASIC, for instance, or position BASIC programs in high memory — the only restriction is your own imagination!

The Appendices contain sample programmes which show you how you can use the ROM routines to speed up your machine language programs and reduce the amount of code you need to write.

DBUG: Eddy Paay was not satisfied with any of the commercially available debugging programs, so he developed his own. DBUG: allows you to single-step through your program; has a disassembler which disassembles the next instruction before executing it or allows you to bypass execution and pass on through the program, disassembling as you go; displays/edits memory in Hex or ASCII; allows Register editing; has the ability to read and write System tapes and all this on the bottom 3 lines of your screen, thus freeing the rest of the screen for program displays. Four versions of DBUG are included in the package to cope with different memory sizes.

The best news of all is the price. The complete Level 2 ROM ASSEMBLY LANGUAGE TOOLKIT is only:

— Aus. $29.95 + $2.00 p&p
— UK £18.00 + £1.00 p&p

SPECIAL OFFER TO OWNERS OF THE LEVEL II ROM REFERENCE MANUAL ...

UPGRADE TO THIS ASSEMBLY LANGUAGE TOOKIT FOR ONLY $19.95!

Send back your original Level II ROM Reference Manual plus a cheque, money order or Bankcard authorisation for $19.95 plus $2.00 p&p and we will send you the new ASSEMBLY LANGUAGE TOOLKIT